Whole Exome Sequencing
Gene package Hearing impairment, version 3.1, 22-11-2017

Technical information
DNA was enriched using Agilent SureSelect Clinical Research Exome V2 capture and paired-end sequenced on the Illumina platform (outsourced). The aim is to obtain 8.1 Giga base pairs per exome with a mapped fraction of 0.99. The average coverage of the exome is ~50x. Duplicate reads are excluded. Data are demultiplexed with bcl2fastq Conversion Software from Illumina. Reads are mapped to the genome using the BWA-MEM algorithm (reference: http://bio-bwa.sourceforge.net/). Variant detection is performed by the Genome Analysis Toolkit HaplotypeCaller (reference: http://www.broadinstitute.org/gatk/). The detected variants are filtered and annotated with Cartagenia software and classified with Alamut Visual. It is not excluded that pathogenic mutations are being missed using this technology. At this moment, there is not enough information about the sensitivity of this technique with respect to the detection of deletions and duplications of more than 5 nucleotides and of somatic mosaic mutations (all types of sequence changes).

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HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x	% covered >30x
ACTB	Baraitser-Winter syndrome 1, 243310 ?Dystonia, juvenile-onset, 607371	102630	135	100	100	100
ACTG1	Baraitser-Winter syndrome 2, 614583 Deafness 20/26, 604717	102560	121	100	100	100
ADCY1	?Deafness 44, 610154	103072	68	97	94	88
ADGRV1	?Febrile seizures, familial, 4, 604352 Usher syndrome, type 2C, 605472 Usher syndrome, type 2C, GPR98/PDZD7 digenic, 605472	602851	60	100	98	90
AIFM1	Combined oxidative phosphorylation deficiency 6, 300816 Cowchock syndrome, 310490 Deafness 5, 300614	300169	41	100	89	67
APOPT1	Mitochondrial complex IV deficiency, 220110	616003	51	100	96	76
ATP1A2	Alternating hemiplegia of childhood, 104290 Migraine, familial basilar, 602481 Migraine, familial hemiplegic, 2, 602481	182340	86	100	100	99
ATP6V1B1	Renal tubular acidosis with deafness, 267300	192132	78	100	100	99

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BCS1L	Bjornstad syndrome, 262000 GRACILE syndrome, 603358 Leigh syndrome, 256000 Mitochondrial complex III deficiency, nuclear type 1, 124000	603647	134	100	100	100
BDP1	No OMIM phenotype	607012	46	99	91	68
BSND	Bartter syndrome, type 4a, 602522 Sensorineural deafness with mild renal dysfunction, 602522	606412	79	100	100	100
CABP2	Deafness 93, 614899	607314	51	100	94	84
CACNA1D	Primary aldosteronism, seizures, and neurologic abnormalities, 615474 Sinoatrial node dysfunction and deafness, 614896	114206	63	100	99	92
CC2D2A	COACH syndrome, 216360 Joubert syndrome 9, 612285 Meckel syndrome 6, 612284	612013	48	100	97	81
CCDC50	?Deafness 44, 607453	611051	52	100	100	94
CD164	?Deafness 66, 616969	603356	57	100	100	86
CDC14A	Deafness 105, 616958	603504	49	100	98	79
CDH23	Deafness 12, 601386 Usher syndrome, type 1D, 601067 Usher syndrome, type 1D/F digenic, 601067	605516	78	100	100	99
CEACAM16	Deafness 4B, 614614	614591	61	100	100	98
CEP78	Cone-rod dystrophy and hearing loss, 617236	617110	47	100	97	78
CIB2	Deafness 48, 609439 Usher syndrome, type IJ, 614869	605564	98	100	100	100
CLDN14	Deafness 29, 614035	605608	95	100	100	100
CLIC5	?Deafness 103, 616042	607293	55	100	100	97
CLPP	Perrault syndrome 3, 614129	601119	70	100	100	100
CLRN1	Retinitis pigmentosa 61, 614180 Usher syndrome, type 3A, 276902	606397	54	100	100	87
COCH	Deafness 9, 601369	603196	50	98	94	88
COL11A1	Fibrochondrogenesis 1, 228520 {Lumbar disc herniation, susceptibility to}, 603932 Marshall syndrome, 154780 Stickler syndrome, type II, 604841	120280	47	100	96	79

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COL11A2	Deafness 13, 601868 Deafness 53, 609706 Fibrochondrogenesis 2, 614524 Otospondylomegaepiphyseal dysplasia, 215150 Stickler syndrome, type III, 184840 Weissenbacher-Zweymuller syndrome, 277610	120290	70	100	100	97
COL2A1	Achondrogenesis, type II or hypochondrogenesis, 200610 Avascular necrosis of the femoral head, 608805 Czech dysplasia, 609162 Epiphyseal dysplasia, multiple, with myopia and deafness, 132450 Kniest dysplasia, 156550 Legg-Calve-Perthes disease, 150600 Osteoarthritis with mild chondrodysplasia, 604864 Platyspondylic skeletal dysplasia, Torrance type, 151210 SED congenita, 183900 SMED Strudwick type, 184250 Spondyloepiphyseal dysplasia, Stanescu type, 616583 Spondyloperipheral dysplasia, 271700 Stickler sydrome, type I, nonsyndromic ocular, 609508 Stickler syndrome, type I, 108300 Vitreoretinopathy with phalangeal epiphyseal dysplasia	120140	65	100	100	96
COL4A3	Alport syndrome, 104200 Alport syndrome, 203780 Hematuria, benign familial, 141200	120070	45	98	93	76
COL4A4	Alport syndrome, 203780 Hematuria, familial benign	120131	48	100	97	80
COL4A5	Alport syndrome, 301050	303630	38	99	86	61
COL4A6	?Deafness 6, 300914	303631	51	100	97	83
COL9A1	?Epiphyseal dysplasia, multiple, 6, 614135 Stickler syndrome, type IV, 614134	120210	46	100	94	81
COL9A2	Epiphyseal dysplasia, multiple, 2, 600204 ?Stickler syndrome, type V, 614284	120260	65	100	100	95
CRYM	Deafness 40, 616357	123740	48	100	99	84
DCDC2	?Deafness 66, 610212 Nephronophthisis 19, 616217 Sclerosing cholangitis, neonatal, 617394	605755	60	100	99	90
DFNA5	Deafness 5, 600994	608798	63	100	100	96
DFNB59	Deafness 59, 610220	610219	72	100	100	91

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DIABLO	Deafness 64, 614152	605219	68	100	100	96
DIAPH1	Deafness 1, 124900 Seizures, cortical blindness, microcephaly syndrome, 616632	602121	60	100	95	83
DIAPH3	Auditory neuropathy, 1, 609129	614567	50	100	99	85
DSPP	Deafness 39, with dentinogenesis, 605594 Dentin dysplasia, type II, 125420 Dentinogenesis imperfecta, Shields type II, 125490 Dentinogenesis imperfecta, Shields type III, 125500	125485	33	87	61	51
EDN3	Central hypoventilation syndrome, congenital, 209880 {Hirschsprung disease, susceptibility to, 4}, 613712 Waardenburg syndrome, type 4B, 613265	131242	69	100	100	100
EDNRB	ABCD syndrome, 600501 {Hirschsprung disease, susceptibility to, 2}, 600155 Waardenburg syndrome, type 4A, 277580	131244	69	100	100	99
ELMOD3	?Deafness 88, 615429	615427	66	100	100	90
EPS8	?Deafness 102, 615974	600206	50	100	97	84
ESPN	Deafness 36, 609006 Deafness, neurosensory, without vestibular involvement	606351	58	96	82	72
ESRRB	Deafness 35, 608565	602167	85	100	100	99
EXOSC2	No OMIM phenotype	602238	49	100	99	86
EYA1	Anterior segment anomalies with or without cataract, 602588 Branchiootic syndrome 1, 602588 Branchiootorenal syndrome 1, with or without cataracts, 113650 ?Otofaciocervical syndrome, 166780	601653	62	100	99	90
EYA4	Cardiomyopathy, dilated, 1J, 605362 Deafness 10, 601316	603550	44	100	98	80
FGF3	Deafness, congenital with inner ear agenesis, microtia, and microdontia, 610706	164950	52	100	98	87
FOXI1	Enlarged vestibular aqueduct, 600791	601093	70	100	100	98
GATA3	Hypoparathyroidism, sensorineural deafness, and renal dysplasia, 146255	131320	81	100	100	100
GIPC3	Deafness 15, 601869	608792	75	100	100	100
GJB2	Bart-Pumphrey syndrome, 149200 Deafness 3A, 601544 Deafness 1A, 220290 Hystrix-like ichthyosis with deafness, 602540 Keratitis-ichthyosis-deafness syndrome, 148210 Keratoderma, palmoplantar, with deafness, 148350 Vohwinkel syndrome, 124500	121011	85	98	90	84

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GJB3	Deafness 2B, 612644 Deafness, with peripheral neuropathy Deafness Deafness, digenic, GJB2/GJB3, 220290 Erythrokeratodermia variabilis et progressiva, 133200	603324	114	100	100	100
GJB6	Deafness 3B, 612643 Deafness 1B, 612645 Deafness, digenic GJB2/GJB6, 220290 Ectodermal dysplasia 2, Clouston type, 129500	604418	117	100	100	100
GPSM2	Chudley-McCullough syndrome, 604213	609245	57	100	100	97
GRHL2	Deafness 28, 608641 Ectodermal dysplasia/short stature syndrome, 616029	608576	70	100	99	90
GRXCR1	Deafness 25, 613285	613283	56	100	99	87
GRXCR2	?Deafness 101, 615837	615762	66	100	100	94
HARS	Charcot-Marie-Tooth disease, axonal, type 2W, 616625 Usher syndrome type 3B, 614504	142810	78	100	100	100
HARS2	?Perrault syndrome 2, 614926	600783	71	100	100	96
HGF	Deafness 39, 608265	142409	60	100	100	96
HOMER2	?Deafness 68, 616707	604799	51	100	99	86
HSD17B4	D-bifunctional protein deficiency, 261515 Perrault syndrome 1, 233400	601860	77	98	98	97
ILDR1	Deafness 42, 609646	609739	49	100	97	80
KARS	?Charcot-Marie-Tooth disease, recessive intermediate, B, 613641 Deafness 89, 613916	601421	66	100	98	92
KCNE1	Jervell and Lange-Nielsen syndrome 2, 612347 Long QT syndrome 5, 613695	176261	83	100	99	87
KCNJ10	Enlarged vestibular aqueduct, digenic, 600791 SESAME syndrome, 612780	602208	147	100	100	100
KCNQ1	Atrial fibrillation, familial, 3, 607554 Jervell and Lange-Nielsen syndrome, 220400 Long QT syndrome 1, 192500 {Long QT syndrome 1, acquired, susceptibility to}, 192500 Short QT syndrome 2, 609621	607542	133	100	100	100
KCNQ4	Deafness 2A, 600101	603537	77	97	92	90
KITLG	Deafness 69, unilateral or asymmetric, 616697 Hyperpigmentation with or without hypopigmentation, 145250 [Skin/hair/eye pigmentation 7, blond/brown hair], 611664	184745	68	97	92	89

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LARS2	?Hydrops, lactic acidosis, and sideroblastic anemia, 617021 Perrault syndrome 4, 615300	604544	60	100	99	80
LHFPL5	Deafness 67, 610265	609427	53	100	100	95
LMX1A	No OMIM phenotype	600298	96	100	100	100
LOXHD1	Deafness 77, 613079	613072	54	100	100	92
LRTOMT	Deafness 63, 611451	612414	71	100	99	94
MARVELD2	Deafness 49, 610153	610572	60	100	100	98
MCM2	?Deafness 70, 616968	116945	70	100	100	97
MET	?Deafness 97, 616705 Hepatocellular carcinoma, childhood type, somatic, 114550 {Osteofibrous dysplasia, susceptibility to}, 607278 Renal cell carcinoma, papillary, 1, familial and somatic, 605074	164860	75	100	100	97
MIR96	Deafness 50, 613074	611606	47	100	98	88
MITF	COMMAD syndrome, 617306 {Melanoma, cutaneous malignant, susceptibility to, 8}, 614456 Tietz albinism-deafness syndrome, 103500 Waardenburg syndrome, type 2A, 193510 Waardenburg syndrome/ocular albinism, digenic, 103470	156845	58	100	100	90
MPZL2	No OMIM phenotype	604873	43	100	100	86
MSRB3	Deafness 74, 613718	613719	47	100	99	81
MYH14	Deafness 4A, 600652 ?Peripheral neuropathy, myopathy, hoarseness, and hearing loss, 614369	608568	72	100	99	95
MYH9	Deafness 17, 603622 Epstein syndrome, 153650 Fechtner syndrome, 153640 Macrothrombocytopenia and progressive sensorineural deafness, 600208 May-Hegglin anomaly, 155100 Sebastian syndrome, 605249	160775	66	100	98	94
MYO15A	Deafness 3, 600316	602666	74	100	98	92
MYO3A	Deafness 30, 607101	606808	55	100	98	85
MYO6	Deafness 22, 606346 Deafness 22, with hypertrophic cardiomyopathy, 606346 Deafness 37, 607821	600970	63	100	98	84
MYO7A	Deafness 11, 601317 Deafness 2, 600060 Usher syndrome, type 1B, 276900	276903	68	100	98	95
NARS2	Combined oxidative phosphorylation deficiency 24, 616239	612803	38	100	93	67

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NLRP3	CINCA syndrome, 607115 Familial cold-induced inflammatory syndrome 1, 120100 Muckle-Wells syndrome, 191900	606416	85	100	100	100
OPA1	Behr syndrome, 210000 {Glaucoma, normal tension, susceptibility to}, 606657 ?Mitochondrial DNA depletion syndrome 14 (encephalocardiomyopathic type), 616896 Optic atrophy 1, 165500 Optic atrophy plus syndrome, 125250	605290	46	100	96	77
OSBPL2	Deafness 67, 616340	606731	67	100	100	95
OTOA	Deafness 22, 607039	607038	63	100	99	92
OTOF	Auditory neuropathy, 1, 601071 Deafness 9, 601071	603681	71	100	100	99
OTOG	Deafness 18B, 614945	604487	73	100	100	98
OTOGL	Deafness 84B, 614944	614925	54	100	96	81
P2RX2	Deafness 41, 608224	600844	77	100	100	99
PAX3	Craniofacial-deafness-hand syndrome, 122880 Rhabdomyosarcoma 2, alveolar, 268220 Waardenburg syndrome, type 1, 193500 Waardenburg syndrome, type 3, 148820	606597	77	100	100	100
PCDH15	Deafness 23, 609533 Usher syndrome, type 1D/F digenic, 601067 Usher syndrome, type 1F, 602083	605514	55	100	98	87
PDZD7	{Retinal disease in Usher syndrome type IIA, modifier of}, 276901 Usher syndrome, type IIC, GPR98/PDZD7 digenic, 605472	612971	67	100	100	97
PET100	Mitochondrial complex IV deficiency, 220110	614770	75	100	100	81
PEX1	Heimler syndrome 1, 234580 Peroxisome biogenesis disorder 1A (Zellweger), 214100 Peroxisome biogenesis disorder 1B (NALD/IRD), 601539	602136	49	100	98	84
PEX6	Heimler syndrome 2, 616617 Peroxisome biogenesis disorder 4A (Zellweger), 614862 Peroxisome biogenesis disorder 4B, 614863	601498	62	100	99	91
PNPT1	Combined oxidative phosphorylation deficiency 13, 614932 Deafness 70, 614934	610316	43	100	94	69
POU3F4	Deafness 2, 304400	300039	73	100	100	100
POU4F3	Deafness 15, 602459	602460	123	100	100	100
PRKCB	No OMIM phenotype	176970	45	100	100	88

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PRPS1	Arts syndrome, 301835 Charcot-Marie-Tooth disease recessive, 5, 311070 Deafness 1, 304500 Gout, PRPS-related, 300661 Phosphoribosylpyrophosphate synthetase superactivity, 300661	311850	43	100	96	79
PTPRQ	Deafness 84A, 613391	603317	61	100	98	90
RAI1	Smith-Magenis syndrome, 182290	607642	99	100	100	100
RDX	Deafness 24, 611022	179410	49	100	94	75
RIPOR2	?Deafness 104, 616515	611410	52	100	98	87
S1PR2	Deafness 68, 610419	605111	115	100	100	100
SERPINB6	?Deafness 91, 613453	173321	60	100	98	82
SIX1	Branchiootic syndrome 3, 608389 Deafness 23, 605192	601205	84	100	100	97
SIX5	Branchiootorenal syndrome 2, 610896	600963	66	100	100	93
SLC17A8	Deafness 25, 605583	607557	48	100	100	93
SLC22A4	{Rheumatoid arthritis, susceptibility to}, 180300	604190	66	100	100	89
SLC26A4	Deafness 4, with enlarged vestibular aqueduct, 600791 Pendred syndrome, 274600	605646	47	100	97	78
SLC26A5	?Deafness 61, 613865	604943	43	100	98	84
SLC33A1	Congenital cataracts, hearing loss, and neurodegeneration, 614482 Spastic paraplegia 42, 612539	603690	55	100	97	78
SLITRK6	Deafness and myopia, 221200	609681	65	100	100	98
SMPX	Deafness 4, 300066	300226	41	100	96	67
SNAI2	Piebaldism, 172800 Waardenburg syndrome, type 2D, 608890	602150	52	100	100	99
SOX10	PCWH syndrome, 609136 Waardenburg syndrome, type 2E, with or without neurologic involvement, 611584 Waardenburg syndrome, type 4C, 613266	602229	68	100	100	100
STRC	Deafness 16, 603720	606440	120	100	100	100
SYNE4	Deafness 76, 615540	615535	74	100	100	100
TBC1D24	DOOR syndrome, 220500 Deafness 86, 614617 Deafness 65, 616044 Epileptic encephalopathy, early infantile, 16, 615338 Myoclonic epilepsy, infantile, familial, 605021	613577	87	100	100	98
TECTA	Deafness 8/12, 601543 Deafness 21, 603629	602574	82	100	99	94
TIMM8A	Mohr-Tranebjaerg syndrome, 304700	300356	102	100	100	100

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TJP2	Cholestasis, progressive familial intrahepatic 4, 615878 Hypercholanemia, familial, 607748	607709	57	100	100	92
TMC1	Deafness 36, 606705 Deafness 7, 600974	606706	43	100	94	77
TMEM132E	No OMIM phenotype	616178	66	100	98	93
TMIE	Deafness 6, 600971	607237	57	100	99	99
TMPRSS3	Deafness 8/10, 601072	605511	50	100	99	89
TMTC2	No OMIM phenotype	615856	58	100	99	93
TNC	Deafness 56, 615629	187380	72	100	99	93
TPRN	Deafness 79, 613307	613354	65	90	78	73
TRIOBP	Deafness 28, 609823	609761	98	100	100	97
TSPEAR	Deafness 98, 614861	612920	72	100	100	99
TWNK	Mitochondrial DNA depletion syndrome 7 (hepatocerebral type), 271245 Perrault syndrome 5, 616138 Progressive external ophthalmoplegia with mitochondrial DNA deletions 3, 609286	606075	109	100	100	99
TYR	Albinism, oculocutaneous, type IA, 203100 Albinism, oculocutaneous, type IB, 606952 {Melanoma, cutaneous malignant, susceptibility to, 8}, 601800 [Skin/hair/eye pigmentation 3, blue/green eyes], 601800 [Skin/hair/eye pigmentation 3, light/dark/freckling skin], 601800 Waardenburg syndrome/albinism, digenic, 103470	606933	67	100	99	93
USH1C	Deafness 18A, 602092 Usher syndrome, type 1C, 276904	605242	57	100	98	89
USH1G	Usher syndrome, type 1G, 606943	607696	111	100	100	100
USH2A	Retinitis pigmentosa 39, 613809 Usher syndrome, type 2A, 276901	608400	59	100	99	92
WBP2	No OMIM phenotype	606962	49	100	90	73
WFS1	?Cataract 41, 116400 Deafness 6/14/38, 600965 {Diabetes mellitus, noninsulin-dependent, association with}, 125853 Wolfram syndrome, 222300 Wolfram-like syndrome, 614296	606201	106	100	100	100
WHRN	Deafness 31, 607084 Usher syndrome, type 2D, 611383	607928	87	100	100	100
YAP1	Coloboma, ocular, 120433 Coloboma, ocular, with or without hearing impairment, cleft lip/palate, and/or mental retardation, 120433	606608	49	100	95	79

- Gene symbols according HGCN
- OMIM release used: 2-6-2017

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- "No OMIM phenotypes" indicates a gene without a current OMIM association
- OMIM phenotypes between "[ ]", indicate "nondiseases," mainly genetic variations that lead to apparently abnormal laboratory test values
- OMIM phenotypes between "{}", indicate risk factors
- OMIM phenotypes with a question mark, "?", before the disease name indicates an unconfirmed or possibly spurious mapping
- The statistics above are based on a set of 96 samples
- Median depth is the median of the mean sequence depth over the protein coding exons (±10bp flanking introns) of the longest transcript
- % Covered 10x describes the percentage of a gene's coding sequence (±10bp flanking introns) that is covered at least 10x
- % Covered 20x describes the percentage of a gene's coding sequence (±10bp flanking introns) that is covered at least 20x