Whole Exome Sequencing
Gene package Autism, version 1, 8-4-2015

Technical information
After DNA was enriched using Agilent Sureselect Clinical Research Exome (CRE) Capture, samples were run on the Illumina Hiseq platform. The aim is to obtain 50 million total reads per exome with a mapped fraction >0.98. The average coverage of the exome is ~50x. Data are demultiplexed by Illumina software bcl2fastq. Reads are mapped to the genome using BWA (reference: http://bio-bwa.sourceforge.net/). Variant detection is performed by Genome Analysis Toolkit (reference: http://www.broadinstitute.org/gatk/). Analysis is performed in Cartagenia using The Variant Calling File (VCF) followed by filtering. 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).

Erasmus MC
University Medical Center Rotterdam

Dept. Clinical Genetics

HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x
ACADVL	VLCAD deficiency, 201475	609575	81	100	97
ACOX1	Peroxisomal acyl-CoA oxidase deficiency, 264470	609751	93	100	100
ADNP	Helsmoortel-van der Aa syndrome, 615873	611386	79	100	99
ADSL	Adenylosuccinase deficiency, 103050	608222	86	100	100
AKT1	Breast cancer, somatic, 114480 Colorectal cancer, somatic, 114500 Ovarian cancer, somatic, 167000 {Schizophrenia, susceptibility to}, 181500 Proteus syndrome, somatic, 176920 Cowden syndrome 6, 615109	164730	87	100	100
ALDH1A3	Microphthalmia, isolated 8, 615113	600463	45	98	86
ALDH5A1	Succinic semialdehyde dehydrogenase deficiency, 271980	610045	61	97	87
AMT	Glycine encephalopathy, 605899	238310	91	100	100
APC	Adenomatous polyposis coli, 175100 Gastric cancer, somatic, 613659 Adenoma, periampullary, somatic Hepatoblastoma, somatic, 114550 Desmoid disease, hereditary, 135290 Colorectal cancer, somatic, 114500 Brain tumor-polyposis syndrome 2, 175100 Gardner syndrome, 175100	611731	74	100	99

HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x
ARID1B	Mental retardation, autosomal dominant 12, 614562	614556	83	98	93
ARX	Epileptic encephalopathy, early infantile, 1, 308350 Lissencephaly, X-linked 2, 300215 Mental retardation, X-linked 29 and others, 300419 Proud syndrome, 300004 Partington syndrome, 309510 Hydranencephaly with abnormal genitalia, 300215	300382	24	84	61
ATP1A2	Migraine, familial hemiplegic, 2, 602481 Alternating hemiplegia of childhood, 104290 Migraine, familial basilar, 602481	182340	109	100	100
ATP1A3	Dystonia-12, 128235 Alternating hemiplegia of childhood 2, 614820 CAPOS syndrome, 601338	182350	96	100	99
AUTS2	Mental retardation, autosomal dominant 26, 615834	607270	81	99	93
BCKDK	Branched-chain ketoacid dehydrogenase kinase deficiency, 614923	614901	95	100	100
C12orf57	Temtamy syndrome, 218340	615140	85	100	100
CACNA1C	Timothy syndrome, 601005 Brugada syndrome 3, 611875	114205	96	100	100
CAMTA1	Cerebellar ataxia, nonprogressive, with mental retardation, 614756	611501	100	100	99
CBS	Homocystinuria, B6-responsive and nonresponsive types, 236200 Thrombosis, hyperhomocysteinemic, 236200	613381	82	100	99
CC2D1A	Mental retardation, autosomal recessive 3, 608443	610055	74	100	99
CDKL5	Epileptic encephalopathy, early infantile, 2, 300672	300203	47	98	94
CDKN1C	Beckwith-Wiedemann syndrome, 130650 IMAGE syndrome, 614732	600856	46	80	72
CHD2	Epileptic encephalopathy, childhood-onset, 615369	602119	75	100	98
CHD7	CHARGE syndrome, 214800 Hypogonadotropic hypogonadism 5 with or without anosmia, 612370	608892	80	100	98
CHD8	{Autism, susceptibility to, 18}, 615032	610528	83	100	99
CHI3L1	{Schizophrenia, susceptibility to}, 181500 {Asthma-related traits, susceptibility to, 7}, 611960	601525	85	100	100
CLN8	Ceroid lipofuscinosis, neuronal, 8, 600143 Ceroid lipofuscinosis, neuronal, 8, Northern epilepsy variant, 610003	607837	100	100	100
CNTNAP2	Cortical dysplasia-focal epilepsy syndrome, 610042 {Autism susceptibility 15}, 612100 Pitt-Hopkins like syndrome 1, 610042	604569	85	100	100
COL18A1	Knobloch syndrome, type 1, 267750	120328	71	100	95
COMT	{Schizophrenia, susceptibility to}, 181500 {Panic disorder, susceptibility to}, 167870	116790	104	100	100

HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x
CRADD	Mental retardation, autosomal recessive 34, 614499	603454	73	100	96
CRBN	Mental retardation, autosomal recessive 2, 607417	609262	87	100	94
CREBBP	Rubinstein-Taybi syndrome, 180849	600140	81	100	97
CTCF	Mental retardation, autosomal dominant 21, 615502	604167	47	96	89
CTNNB1	Mental retardation, autosomal dominant 19, 615075 Colorectal cancer, somatic, 114500 Pilomatricoma, somatic, 132600 Ovarian cancer, somatic, 167000 Hepatocellular carcinoma, somatic, 114550	116806	81	100	100
DAO	{Schizophrenia}, 181500	124050	95	100	100
DAOA	{Schizophrenia}, 181500	607408	37	96	80
DCHS1	Van Maldergem syndrome 1, 601390 Mitral valve prolapse 2, 607829	603057	70	99	97
DEAF1	Mental retardation, autosomal dominant 24, 615828	602635	81	87	82
DEPDC5	Epilepsy, familial focal, with variable foci, 604364	614191	53	99	90
DHCR7	Smith-Lemli-Opitz syndrome, 270400	602858	114	100	100
DISC1	{Schizophrenia, susceptibility to}, 604906 {Schizoaffective disorder, susceptibility to}, 181500	605210	85	98	94
DISC2	Schizophrenia, 181500	606271	No coverage data		
DPYD	Dihydropyrimidine dehydrogenase deficiency, 274270 5-fluorouracil toxicity, 274270	612779	79	98	95
DRD3	{Schizophrenia, susceptibility to}, 181500 {Essential tremor, susceptibility to}, 190300	126451	93	100	100
DRD4	Autonomic nervous system dysfunction [Novelty seeking personality], 601696 {Attention deficit-hyperactivity disorder}, 143465	126452	70	97	82
DRD5	{Blepharospasm, primary benign}, 606798 Dystonia, primary cervical {Attention deficit-hyperactivity disorder, susceptibility to}, 143465	126453	62	100	100
DTNBP1	{Schizophrenia}, 181500 Hermansky-Pudlak syndrome 7, 614076	607145	73	100	97
DYNC1H1	Charcot-Marie-Tooth disease, axonal, type 20, 614228 Mental retardation, autosomal dominant 13, 614563 Spinal muscular atrophy, lower extremity-predominant 1, AD, 158600	600112	86	100	99
DYRK1A	Mental retardation, autosomal dominant 7, 614104	600855	99	100	100
EDNRB	{Hirschsprung disease, susceptibility to, 2}, 600155 ABCD syndrome, 600501 Waardenburg syndrome, type 4A, 277580	131244	93	100	100
EHMT1	Kleefstra syndrome, 610253	607001	97	99	99

HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x
EIF4E	{Autism, susceptibility to, 19}, 615091	133440	11	45	17
ELP4	?Aniridia, 106210	606985	48	89	78
FOXG1	Rett syndrome, congenital variant, 613454	164874	80	83	77
FOXP1	Mental retardation with language impairment and with or without autistic features, 613670	605515	80	100	98
FOXP2	Speech-language disorder-1, 602081	605317	76	100	100
GAMT	Cerebral creatine deficiency syndrome 2, 612736	601240	59	99	89
GATM	Cerebral creatine deficiency syndrome 3, 612718	602360	93	100	100
GCSH	Glycine encephalopathy, 605899	238330	14	61	18
GLDC	Glycine encephalopathy, 605899	238300	36	81	62
GLYCTK	D-glyceric aciduria, 220120	610516	92	100	100
GRIN2A	Epilepsy, focal, with speech disorder and with or without mental retardation, 245570	138253	80	100	100
GRIN2B	Mental retardation, autosomal dominant 6, 613970 Epileptic encephalopathy, early infantile, 27, 616139	138252	95	100	100
H19	Beckwith-Wiedemann syndrome, 130650 Silver-Russell syndrome, 180860 Wilms tumor 2, 194071	103280	No coverage data		
HCN1	Epileptic encephalopathy, early infantile, 24, 615871	602780	70	100	99
HDAC4	No OMIM phenotype	605314	73	100	100
HDC	{Gilles de la Tourette syndrome, susceptibility to}, 137580	142704	98	100	100
HEPACAM	Megalencephalic leukoencephalopathy with subcortical cysts 2A, 613925 Megalencephalic leukoencephalopathy with subcortical cysts 2B, remitting, with or without mental retardation, 613926	611642	63	99	83
HERC2	[Skin/hair/eye pigmentation 1, blue/nonblue eyes], 227220 [Skin/hair/eye pigmentation 1, blond/brown hair], 227220 Mental retardation, autosomal recessive 38, 615516	605837	37	73	63
HOXA1	Bosley-Salih-Alorainy syndrome, 601536 Athabaskan brainstem dysgenesis syndrome, 601536	142955	108	100	100
HRAS	{Bladder cancer, somatic}, 109800 Costello syndrome, 218040 {Thyroid carcinoma, follicular, somatic}, 188470 Congenital myopathy with excess of muscle spindles, 218040 {Nevus sebaceous or woolly hair nevus, somatic}, 162900 Schimmelpenning-Feuerstein-Mims syndrome, somatic mosaic, 163200 {Spitz nevus or nevus spilus, somatic}, 137550	190020	128	100	100

HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x
HTR2A	{Schizophrenia, susceptibility to}, 181500 {Obsessive-compulsive disorder, susceptibility to}, 164230 {Seasonal affective disorder, susceptibility to}, 608516 {Alcohol dependence, susceptibility to}, 103780 {Anorexia nervosa, susceptibility to}, 606788 {Major depressive disorder, response to citalopram therapy in}, 608516	182135	92	100	100
IFNG	{TSC2 angiomyolipomas, renal, modifier of}, 613254 {Aplastic anemia}, 609135 {Tuberculosis, protection against}, 607948 {AIDS, rapid progression to}, 609423 ;{Hepatitis C virus, response to therapy of}, 609532	147570	73	100	100
IL1RAPL1	Mental retardation, X-linked 21/34, 300143	300206	50	100	100
INPP5E	Mental retardation, truncal obesity, retinal dystrophy, and micropenis, 610156 Joubert syndrome 1, 213300	613037	71	98	92
KCNQ1OT1	Beckwith-Wiedemann syndrome, 130650	604115	No coverage data		
KMT2A	Wiedemann-Steiner syndrome, 605130 Leukemia, myeloid/lymphoid or mixed-lineage	159555	55	99	95
LAMA1	Poretti-Boltshauser syndrome, 615960	150320	88	100	99
MAB21L2	Microphthalmia, syndromic 14, 615877	604357	96	100	100
MAGEL2	Schaaf-Yang syndrome, 615547	605283	70	100	97
MAN1B1	Mental retardation, autosomal recessive 15, 614202	604346	91	100	100
MAOA	Brunner syndrome, 300615	309850	39	100	86
MBD5	Mental retardation, autosomal dominant 1, 156200	611472	82	100	100
MEF2C	Mental retardation, stereotypic movements, epilepsy, and/or cerebral malformations, 613443 Chromosome 5q14.3 deletion syndrome, 613443	600662	66	100	98
METTL23	Mental retardation, autosomal recessive 44, 615942	615262	42	100	100
MLC1	Megalencephalic leukoencephalopathy with subcortical cysts, 604004	605908	71	100	96
MTHFR	Homocystinuria due to MTHFR deficiency, 236250 {Schizophrenia, susceptibility to}, 181500 {Vascular disease, susceptibility to} {Neural tube defects, susceptibility to}, 601634 {Thromboembolism, susceptibility to}, 188050	607093	94	100	100
MUT	Methylmalonic aciduria, mut(0) type, 251000	609058	81	100	100
NAGLU	Mucopolysaccharidosis type IIIB (Sanfilippo B), 252920 ?Charcot-Marie-Tooth disease, axonal, type 2V, 616491	609701	81	100	93
NHS	Nance-Horan syndrome, 302350 Cataract 40, X-linked, 302200	300457	48	95	92
NIPBL	Cornelia de Lange syndrome 1, 122470	608667	64	98	93

HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x
NLGN4X	{Autism susceptibility, X-linked 2}, 300495 {Asperger syndrome susceptibility, X-linked 2}, 300497 Mental retardation, X-linked, 300495	300427	74	100	100
NR2F1	Bosch-Boonstra-Schaaf optic atrophy syndrome, 615722	132890	123	100	100
NRXN1	Pitt-Hopkins-like syndrome 2, 614325 {Schizophrenia, susceptibility to, 17}, 614332	600565	102	100	99
NSD1	Sotos syndrome 1, 117550 Leukemia, acute myeloid, 601626 Beckwith-Wiedemann syndrome, 130650	606681	90	100	99
NSUN2	Mental retardation, autosomal recessive 5, 611091	610916	78	100	95
PAFAH1B1	Lissencephaly 1, 607432 Subcortical laminar heterotopia, 607432	601545	68	100	97
PAH	Phenylketonuria, 261600 [Hyperphenylalaninemia, non-PKU mild], 261600	612349	112	100	100
PAX6	Aniridia, 106210 Peters anomaly, 604229 Cataract with late-onset corneal dystrophy, 106210 Keratitis, 148190 Foveal hypoplasia 1, 136520 ?Morning glory disc anomaly, 120430 Optic nerve hypoplasia, 165550 Coloboma, ocular, 120200 Coloboma of optic nerve, 120430 Gillespie syndrome, 206700	607108	62	100	99
PDE4D	{Stroke, susceptibility to, 1}, 606799 Acrodysostosis 2, with or without hormone resistance, 614613	600129	64	99	95
PEX7	Rhizomelic chondrodysplasia punctata, type 1, 215100 Peroxisome biogenesis disorder 9B, 614879	601757	68	100	89
PIGV	Hyperphosphatasia with mental retardation syndrome 1, 239300	610274	102	100	100
PLA2G6	Infantile neuroaxonal dystrophy 1, 256600 Neurodegeneration with brain iron accumulation 2B, 610217 Parkinson disease 14, autosomal recessive, 612953	603604	88	100	99
POMT1	Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 1, 236670 Muscular dystrophy-dystroglycanopathy (congenital with mental retardation), type B, 1, 613155 Muscular dystrophy-dystroglycanopathy (limb-girdle), type C, 1, 609308	607423	90	100	100
PRODH	Hyperprolinemia, type I, 239500 {Schizophrenia, susceptibility to, 4}, 600850	606810	51	95	83

HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x
PTEN	Cowden syndrome 1, 158350 Lhermitte-Duclos syndrome, 158350 Bannayan-Riley-Ruvalcaba syndrome, 153480 {Meningioma}, 607174 {Glioma susceptibility 2}, 613028 Macrocephaly/autism syndrome, 605309 PTEN hamartoma tumor syndrome VATER association with macrocephaly and ventriculomegaly, 276950 {Prostate cancer, somatic}, 176807 Malignant melanoma, somatic, 155600 Endometrial carcinoma, somatic, 608089 Squamous cell carcinoma, head and neck, somatic, 275355	601728	57	77	73
RAX	Microphthalmia, isolated 3, 611038	601881	77	96	80
RNF135	Macrocephaly, macrosomia, facial dysmorphism syndrome, 614192	611358	57	100	97
RPL5	Diamond-Blackfan anemia 6, 612561	603634	22	64	40
RTN4R	{Schizophrenia, susceptibility to}, 181500	605566	60	100	99
SCN1A	Epilepsy, generalized, with febrile seizures plus, type 2, 604403 Dravet syndrome, 607208 Migraine, familial hemiplegic, 3, 609634 Febrile seizures, familial, 3A, 604403	182389	100	100	99
SCN2A	Seizures, benign familial infantile, 3, 607745 Epileptic encephalopathy, early infantile, 11, 613721	182390	100	100	99
SCN8A	?Cognitive impairment with or without cerebellar ataxia, 614306 Epileptic encephalopathy, early infantile, 13, 614558	600702	97	100	99
SCN9A	Erythermalgia, primary, 133020 Paroxysmal extreme pain disorder, 167400, Insensitivity to pain, congenital, 243000 Febrile seizures, familial, 3B, 613863 Epilepsy, generalized, with febrile seizures plus, type 7, 613863 Small fiber neuropathy, 133020 {Dravet syndrome, modifier of}, 607208 HSAN2D, autosomal recessive, 243000	603415	98	100	98
SEMA3E	?CHARGE syndrome, 214800	608166	72	100	100
SETBP1	Schinzel-Giedion midface retraction syndrome, 269150 Mental retardation, autosomal dominant 29, 616078	611060	74	98	97
SETD5	Mental retardation, autosomal dominant 23, 615761	615743	57	99	96
SHANK2	{Autism susceptibility 17}, 613436	603290	81	100	100
SHANK3	Phelan-McDermid syndrome, 606232 {Schizophrenia 15}, 613950	606230	56	93	82

HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x
SLC35A3	?Arthrogryposis, mental retardation, and seizures, 615553	605632	30	94	67
SLC35C1	Congenital disorder of glycosylation, type IIc, 266265	605881	103	100	100
SLC3A1	Cystinuria, 220100	104614	99	100	100
SLC7A9	Cystinuria, 220100	604144	98	100	100
SLC9A9	?{Autism susceptibility 16}, 613410	608396	68	100	98
SLITRK1	Tourette syndrome, 137580 ?Trichotillomania, 613229	609678	62	100	100
SMAD4	Pancreatic cancer, somatic, 260350 Juvenile polyposis/hereditary hemorrhagic telangiectasia syndrome, 175050 Myhre syndrome, 139210 Polyposis, juvenile intestinal, 174900	600993	76	100	98
SMARCA2	Nicolaides-Baraitser syndrome, 601358	600014	78	98	96
SOX10	Waardenburg syndrome, type 4C, 613266 Waardenburg syndrome, type 2E, with or without neurologic involvement, 611584 PCWH syndrome, 609136	602229	45	99	87
STAT3	Hyper-IgE recurrent infection syndrome, 147060 Autoimmune disease, multisystem, infantile-onset, 615952	102582	81	100	98
SYN2	{Schizophrenia, susceptibility to}, 181500	600755	64	91	84
SYNGAP1	Mental retardation, autosomal dominant 5, 612621	603384	55	95	82
TBC1D20	Warburg micro syndrome 4, 615663	611663	51	93	85
TBX1	Conotruncal anomaly face syndrome, 217095 DiGeorge syndrome, 188400 Velocardiofacial syndrome, 192430 Tetralogy of Fallot, 187500	602054	55	79	66
TCF12	Craniosynostosis 3, 615314	600480	51	100	94
TM4SF20	{Specific language impairment 5}, 615432	615404	61	100	100
TMEM5	Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 10, 615041	605862	106	100	99
TRAPPC9	Mental retardation, autosomal recessive 13, 613192	611966	85	100	99
TSC1	Tuberous sclerosis-1, 191100 Lymphangioleiomyomatosis, 606690 Focal cortical dysplasia, Taylor balloon cell type, 607341	605284	94	100	99
TSC2	Tuberous sclerosis-2, 613254 Lymphangioleiomyomatosis, somatic, 606690	191092	94	100	100
TUBA1A	Lissencephaly 3, 611603	602529	34	93	78
UBE3A	Angelman syndrome, 105830	601623	61	100	99
UQCC2	?Mitochondrial complex III deficiency, nuclear type 7, 615824	614461	51	100	91

HGNC approved gene symbol	Phenotype description including OMIM phenotype ID(s)	OMIM gene ID	median depth	% covered >10x	% covered >20x
WFS1	Wolfram syndrome, 222300 Deafness, autosomal dominant 6/14/38, 600965 Wolfram-like syndrome, autosomal dominant, 614296 {Diabetes mellitus, noninsulin-dependent, association with}, 125853 ?Cataract 41, 116400	606201	102	100	100
XPC	Xeroderma pigmentosum, group C, 278720	613208	95	100	100
ZBTB20	Primrose syndrome, 259050	606025	91	100	99
ZFPM2	Tetralogy of Fallot, 187500 Diaphragmatic hernia 3, 610187 46XY sex reversal 9, 616067	603693	78	100	100
ZMYND11	Mental retardation, autosomal dominant 30, 616083	608668	43	98	88

- Gene symbols according HGCN
- OMIM release used: 17-3-2016
- "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 50 samples
- Median depth is the median of the mean sequence depth over the protein coding exons of the transcript
- % Covered 10x describes the percentage of a gene's coding sequence that is covered at least 10x
- % Covered 20x describes the percentage of a gene's coding sequence that is covered at least 20x