INVITAE

detect
Lysosomal Storage Diseases

ORDER ID
For Invitae internal use only

Requisition Form
Detect Lysosomal Storage Diseases TRF949-6

This requisition form can be used to submit an order for the **Detect Lysosomal Storage Diseases Program**, a sponsored testing program for lysosomal storage diseases.

INSTRUCTIONS: Review the ordering options and then complete all sections of this form. Your ordering option will be indicated in the test selection section.

ORDERING OPTIONS

1. DETECT LYSOSOMAL STORAGE DISEASES PROGRAM

For individuals that meet the eligibility criteria below and wish to receive the program specific genetic testing panels.

REQUIRED: You must select below the appropriate eligibility criteria for this patient.

This program is available to patients in the U.S. and Canada suspected of having a lysosomal storage disease (LSD) based on one or more of the following (please select all that apply):

- ◯ Clinical features
- ◯ Suspicion or known diagnosis of a specific LSD
- ◯ Family history of LSD
- ◯ Lab result suggestive of LSD
- ◯ Presumptive positive NBS

2. GENE-SPECIFIC FAMILY FOLLOW-UP TESTING

For relatives of program participants who received a Pathogenic/Likely Pathogenic result or approved VUS who want to receive gene specific family follow-up testing at no additional cost. Relatives do not need to meet the eligibility criteria listed above. Learn more at www.invitae.com/family.

PATIENT INFORMATION

First name	MI	Last name

Date of birth (MM/DD/YYYY)	Biological sex ◯ M ◯ F	MRN (medical record number)

Ancestry ◯ Asian ◯ Black/African American ◯ White/Caucasian ◯ Ashkenazi Jewish ◯ Hispanic ◯ Native American ◯ Pacific Islander ◯ French Canadian ◯ Sephardic Jewish ◯ Mediterranean ◯ Other: _____

Phone	Email address (report access after clinician releases)

Address	City

State/Prov	ZIP/Postal code	Country

Ship a saliva kit to this patient (to submit, fax this form to Client Services at 415-276-4164)
- ◯ Ship kit to address above
- ◯ Ship kit to alternate address: _____

SPECIMEN INFORMATION

Specimen type: Blood (3-mL purple EDTA) -OR- Saliva (Oragene™) -OR- Assisted Saliva -OR- DNA source: _____

We are unable to accept blood/saliva from patients with:
- *Allogeneic bone marrow transplants*
- *Blood transfusion <2 weeks prior to specimen collection*

Specimen collection date (MM/DD/YYYY): *If not provided, the day before specimen receipt will be used*

Special cases: ◯ History of/current hematologic malignancy in patient

INVITAE PARTNER CODE LYSO

CLINICIAN INFORMATION

Organization name	

Phone	Fax

Address	City

State/Prov	ZIP/Postal code	Country

Primary clinical contact name (if different from ordering provider)	NPI

Primary clinical contact email address (for report access)

Ordering provider (select one ordering provider by marking the checkbox before the name)

	Name	NPI	Email address (for report access)
◯			
◯			
◯			
◯			
◯			
◯			

Additional clinical or laboratory contacts (optional, to share access to order online)

◯ **Share this order with the primary clinical contact's default clinical team, manage at invitae.com**

Name	Email address (for report access)

Name	Email address (for report access)

CLINICAL HISTORY

FAMILY HISTORY

Is there a family history of disease for which the patient is being tested? ◯ Yes ◯ No If yes, describe below and attach pedigree and/or clinical notes.

Relative's relationship to this patient	Maternal or paternal	Diagnosed condition	Age at diagnosis	Relative's relationship to this patient	Maternal or paternal	Diagnosed condition	Age at diagnosis

PERSONAL HISTORY

Is/was this patient affected or symptomatic?† ◯ Yes ◯ No

Provide details in the required clinical history questions (if applicable).

† Symptomatic means this patient has features or signs known or suspected to be related to the genetic testing being ordered and could include findings on physical examination, laboratory tests, or imaging.

REQUIRED CLINICAL HISTORY

Suspicion of lysosomal storage disease based on (check any and all that apply):

◯ **Clinical features (see symptom list below)**

◯ **Suspicion or known diagnosis of a specific lysosomal storage disease (specify disorder on page 3)**

Age at onset: _____ Clinical diagnosis: _____

◯ **Family history of lysosomal storage disease**

Specify disorder: _____

◯ **Lab result suggestive of lysosomal storage disease**

◯ Elevated GAGs: Specify type(s) _____

◯ Abnormal LSD enzyme analysis: Enzyme: _____

Patient value: _____ Reference range: _____

◯ **Presumptive positive NBS disorder**

Specify disorder: _____

If you selected "clinical features" on page 1, select all that apply in the following list:

Heart:
- ◯ Evidence of storage on heart biopsy
- ◯ Dilated cardiomyopathy
- ◯ Hypertrophic cardiomyopathy
- ◯ Valvular disease

Gastrointestinal:
- ◯ Evidence of storage on liver biopsy
- ◯ Hepatosplenomegaly/hepatomegaly/splenomegaly

Kidney:
- ◯ Chronic kidney failure
- ◯ Evidence of storage on kidney biopsy
- ◯ Proteinuria of unknown etiology

Nervous system:
- ◯ Acroparesthesisa
- ◯ Behavioral disturbances, personality changes, psychosis, or hyperactivity
- ◯ Cognitive decline
- ◯ Developmental delay
- ◯ Intellectual disability
- ◯ Leukodystrophy
- ◯ Limb girdle muscular dystrophy
- ◯ Loss of coordination/ataxia
- ◯ Macrocephaly
- ◯ Peripheral neuropathy
- ◯ Regression of milestones
- ◯ Seizures
- ◯ Spasticity
- ◯ Speech delay
- ◯ Stroke
- ◯ Tremors

Eye:
- ◯ Cataracts
- ◯ Cherry red spot
- ◯ Corneal clouding
- ◯ Corneal verticillata
- ◯ Horizontal gaze palsy
- ◯ Oculomotor apraxia
- ◯ Retinal blindness
- ◯ Retinal/scleral vessel tortuosity
- ◯ Supranuclear gaze palsy

Skeletal:
- ◯ Bone crisis
- ◯ Carpal tunnel in childhood
- ◯ Dysostosis multiplex
- ◯ Erlenmeyer flask deformity
- ◯ Focal lytic/ sclerotic lesions
- ◯ Gibbus deformity
- ◯ Joint pain/immobility
- ◯ Pathological fractures not related to cancer
- ◯ Short stature

Other:
- ◯ Angioketatomas
- ◯ Anhydrosis/ hypohydrosis
- ◯ Facial coarsening
- ◯ Gingival hyperplasia
- ◯ Hearing loss (conductive, sensorineural, or mixed)
- ◯ Hirsutism
- ◯ Hypotonia
- ◯ Macroglossia
- ◯ Umbilical hernia
- ◯ Unexplained tinnitus

List other relevant clinical information (symptoms, imaging studies, etc):

CLINICAL HISTORY (continued)

If you selected "suspicion or known diagnosis of a specific lysosomal storage disease", specify disorder in the following list:

- ◯ α-Mannosidosis
- ◯ Aspartylglucosaminuria
- ◯ ß-Mannosidosis
- ◯ Cystinosis
- ◯ Danon disease
- ◯ Fabry disease
- ◯ Farber disease
- ◯ Fucosidosis
- ◯ Galactosialidosis
- ◯ GM1 gangliosidosis, Mucopolysaccharidosis IVb
- ◯ GM2-gangliosidosis, AB variant
- ◯ Infantile sialic acid storage disease, Salla disease
- ◯ Krabbe disease
- ◯ Lysosomal acid lipase deficiency
- ◯ Metachromatic leukodystrophy
- ◯ Mucolipidosis type I, Sialidosis I
- ◯ Mucolipidosis type II alpha/beta, Mucolipidosis III alpha/beta
- ◯ Mucolipidosis type III gamma
- ◯ Mucolipidosis type IV
- ◯ Mucopolysaccharidosis I
- ◯ Mucopolysaccharidosis II
- ◯ Mucopolysaccharidosis IIIA
- ◯ Mucopolysaccharidosis IIIB
- ◯ Mucopolysaccharidosis IIIC
- ◯ Mucopolysaccharidosis IIID
- ◯ Mucopolysaccharidosis IVa
- ◯ Mucopolysaccharidosis VI
- ◯ Mucopolysaccharidosis VII
- ◯ Mucopolysaccharidosis IX
- ◯ Multiple sulfatase deficiency
- ◯ Neuronal ceroid lipofuscinosis 1 (CLN1)
- ◯ Neuronal ceroid lipofuscinosis 2 (CLN2)
- ◯ Neuronal ceroid lipofuscinosis 3 (CLN3)
- ◯ Neuronal ceroid lipofuscinosis 5 (CLN5)
- ◯ Neuronal ceroid lipofuscinosis 6 (CLN6)
- ◯ Neuronal ceroid lipofuscinosis 7 (CLN7)
- ◯ Neuronal ceroid lipofuscinosis 8 (CLN8)
- ◯ Neuronal ceroid lipofuscinosis 10 (CLN10)
- ◯ Neuronal ceroid lipofuscinosis 14 (CLN14)
- ◯ Niemann Pick types A and B
- ◯ Niemann-Pick type C
- ◯ Pompe disease
- ◯ Prosaposin deficiency, SapA deficiency (Krabbe variant), SapB deficiency (MLD variant), SapC deficiency (Gaucher variant)
- ◯ Pycnodysostosis
- ◯ Sandhoff disease
- ◯ Schindler disease
- ◯ Tay-Sachs disease

Current treatment:

- ◯ Chaperone therapy
- ◯ Enzyme replacement therapy
- ◯ Gene therapy
- ◯ Stem cell transplant
- ◯ Stop codon read-through
- ◯ Substrate reduction therapy
- ◯ Supportive care
- ◯ Other: _____

OPTIONAL - REQUESTED VARIANTS FOR THIS PATIENT'S REPORT, IF KNOWN

*To have the presence or absence of specific variants commented on in this patient's report, provide the details below. For gene-specific family follow-up see **Note** under Test Selection.*

Was the proband (individual with variant) tested at Invitae? ◯ Yes, Invitae Order ID: RQ# _____ ◯ No: Attach copy of lab results (*required*)

Variant(s) *(e.g. GENE c.2200A>T (p.Thr734Ser) NM_00012345) If left blank, all variants identified in the proband will be commented on.*		**This patient's relationship to proband:**
		◯ Parent ◯ Sibling ◯ Grandchild
		◯ Child ◯ Self ◯ Other: _____

TEST SELECTION – Select option 1 or 2:

○ 1. DETECT LYSOSOMAL STORAGE DISEASES PROGRAM – Indicate test(s) to be performed below.

All tests on this form are organized by clinical area. If your order contains tests from multiple clinical areas, you will need to send a specimen tube for each clinical area. Each clinical area represents a report. If the test comes back negative, clinicians have the option of re-requisition to another panel within the original clinical area.

CLINICAL AREA: METABOLIC AND IMMUNOLOGY

Test code	Test name	# of genes	Gene list
○ 06170	Invitae Comprehensive Lysosomal Storage Disorders Panel*	48	AGA, ARSA, ARSB, ASAH1, CLN2 (TPP1), CLN3, CLN5, CLN6, CLN8, CTNS, CTSA, CTSD, CTSK, FUCA1, GAA, GALC, GALNS, GLA, GLB1, GM2A, GNPTAB, GNPTG, GNS, GUSB, HEXA, HEXB, HGSNAT, HYAL1, IDS, IDUA, KCTD7, LAMP2, LIPA, MAN2B1, MANBA, MCOLN1, MFSD8, NAGA, NAGLU, NEU1, NPC1, NPC2, PPT1, PSAP, SGSH, SLC17A5, SMPD1, SUMF1
	○ 06170.1 Add-on chitotriosidase deficiency gene	1	CHIT1
	○ 06170.2 Add-on preliminary-evidence gene	1	ATP13A2
	○ 06170.3 Add-on adult-onset neuronal ceroid lipofuscinoses genes	3	CTSF, DNAJC5, GRN
○ 06185	Invitae Comprehensive Mucopolysaccharidoses (MPS) Panel	11	ARSB, GALNS, GLB1, GNS, GUSB, HGSNAT, HYAL1, IDS, IDUA, NAGLU, SGSH
	○ 06185.1 Add-on mucolipidosis and oligosaccharidoses genes	12	AGA, CTSA, CTSK, FUCA1, GNPTAB, GNPTG, MAN2B1, MANBA, MCOLN1, NAGA, NEU1, SLC17A5
○ 04713	Invitae Canavan Disease Test	1	ASPA
○ 06183	Invitae Wilson Disease Test	1	ATP7B

**This panel does not currently test for Gaucher disease.*

INDIVIDUAL GENES

○ AGA	○ ARSA	○ ARSB	○ ASAH1	○ CLN2 (TPP1)	○ CLN3	○ CLN5	○ CLN6
○ CLN8	○ CTNS	○ CTSA	○ CTSD	○ CTSK	○ FUCA1	○ GAA	○ GALC
○ GALN5	○ GLA	○ GLB1	○ GM2A	○ GNPTAB	○ GNPTG	○ GNS	○ GUSB
○ HEXA	○ HEXB	○ HGSNAT	○ HYAL1	○ IDS	○ IDUA	○ KCTD7	○ LAMP2
○ LIPA	○ MAN2B1	○ MANBA	○ MCOLN1	○ MFSD8	○ NAGA	○ NAGLU	○ NEU1
○ NPC1	○ NPC2	○ PPT1	○ PSAP	○ SGSH	○ SLC17A5	○ SMPD1	○ SUMF1

TEST SELECTION - (continued)

CLINICAL AREA: CARDIOLOGY/NEUROLOGY

Test code	Test name		# of genes	Gene list
○ 02251	Invitae Cardiomyopathy Comprehensive Panel		50	ABCC9, ACTC1, ACTN2, AGL, BAG3, CACNA1C, CAV3, CRYAB, CSRP3, DES, DMD, DOLK, DSC2, DSG2, DSP, EMD, EYA4, FHL1, FKRP, FKTN, FLNC, GAA, GLA, HCN4, JUP, LAMP2, LMNA, MYBPC3, MYH7, MYL2, MYL3, PKP2, PLN, PRKAG2, RAF1, RBM20, RYR2, SCN5A, SGCD, SLC22A5, TAZ, TCAP, TMEM43, TNNC1, TNNI3, TNNT2, TPM1, TTN, TTR, VCL
	○ 02251.1	Add-on preliminary-evidence genes	31	ANKRD1, CALR3, CHRM2, CTF1, CTNNA3, DTNA, FHL2, GATA4, GATA6, GATAD1, ILK, JPH2, LAMA4, LDB3, LRRC10, MED12, MYH6, MYLK2, MYOM1, MYOZ2, MYPN, NEBL, NEXN, NKX2-5, NPPA, PDLIM3, PLEKHM2, PRDM16, TGFB3, TMPO, TXNRD2
	○ 02251.2	Add-on RASopathy genes not included in panel	17	A2ML1, BRAF, CBL, HRAS, KRAS, MAP2K1, MAP2K2, NF1, NRAS, PTPN11, RASA1, RIT1, RRAS, SHOC2, SOS1, SOS2, SPRED1
	○ 02251.3	Add-on autosomal recessive syndromic pediatric cardiomyopathy genes	8	ACADVL, ALMS1, CPT2, DNAJC19, ELAC2, MTO1, SDHA, TMEM70
○ 03280	Invitae Comprehensive Neuromuscular Disorders Panel		109	ACTA1, AGRN, ALG2, ANO5, ATP2A1, B3GALNT2, B4GAT1, BAG3, BIN1, CACNA1S, CAPN3, CAV3, CCDC78, CFL2, CHAT, CHKB, CHRNA1, CHRNB1, CHRND, CHRNE, CLCN1, CNTN1, COL12A1, COL6A1, COL6A2, COL6A3, COLQ, CPT2, CRYAB, DAG1, DES, DMD, DNAJB6, DNM2, DOK7, DPAGT1, DPM1, DPM2, DPM3, DYSF, EMD, FHL1, FKBP14, FKRP, FKTN, FLNC, GAA, GFPT1, GMPPB, GNE, GYS1, ISPD, ITGA7, KBTBD13, KCNJ2, KLHL40, KLHL41, LAMA2, LAMP2, LARGE1, LDB3, LMNA, LMOD3, MATR3, MEGF10, MTM1, MUSK, MYH2, MYH7, MYL2, MYOT, MYPN, NEB, PLEC, PNPLA2, POMGNT1, POMGNT2, POMK, POMT1, POMT2, PREPL, RAPSN, RXYLT1, RYR1, SCN4A, SELENON, SGCA, SGCB, SGCD, SGCG, SLC5A7, SMN1, SMN2, SQSTM1, STAC3, STIM1, TAZ, TCAP, TIA1, TNNT1, TNPO3, TOR1AIP1, TPM2, TPM3, TRAPPC11, TRIM32, TTN, VCP, VMA21
	○ 03280.1	Add-on preliminary-evidence genes	13	ALG14, HNRNPA2B1, HNRNPDL, LAMB2, LIMS2, LRP4, MYF6, SNAP25, SUN1, SUN2, SYNE1, SYNE2, TMEM4
	○ 03280.2	Add-on facioscapulohumeral muscular dystrophy type 2 (FSHD2) gene	1	SMCHD1

○ 2. GENE-SPECIFIC FAMILY FOLLOW-UP TESTING *For relatives of a program participant ('proband') who received a Pathogenic/Likely Pathogenic result or approved VUS.*

Proband's Invitae Order ID:	This patient's relationship to proband:	Gene(s) to be tested in this patient:
RQ# _____	○ Parent ○ Sibling ○ Grandchild ○ Child ○ Other: _____	

***NOTE**: The presence or absence of all variants identified in the proband for the gene(s) ordered for gene-specific family follow-up will be commented on in this patient's report unless a limited selection is specified in the **Requested Variants** section above. Invitae will report any Pathogenic/Likely Pathogenic variants found in this patient for the gene(s) ordered.*

Invitae continually updates its panels based on the most recent evidence. If an order is placed using an outdated test requisition form, Invitae reserves the right to upgrade ordered tests to their current versions. Test IDs containing add-on codes will include the original panel as well as the add-on.

By signing this form, the medical professional acknowledges that the individual/family member authorized to make decisions for the individual (collectively, the "Patient") has been supplied information regarding and consented to undergo genetic testing, substantially as set forth in Invitae's Informed Consent for Genetic Testing (www.invitae.com/forms). In connection with the Program the Patient has been informed that Invitae may notify them of clinical updates related to genetic test results (in consultation with the ordering medical professional as indicated) and has been informed that de-identified Patient data may be used and shared with third parties, for research and commercial purposes and, in the U.S., to contact their medical professional. For orders originating in Canada, the Patient has been informed that their personal information and specimen will be transferred to and processed in the U.S. and that de-identified Patient data may be used and shared for research and commercial purposes in the U.S. The medical professional warrants that he/she will not seek reimbursement for this no-charge test from any third party, including but not limited to federal healthcare programs. The medical professional also hereby acknowledges that organization and clinician contact information provided in the order may be shared with third parties, including commercial organizations, that may contact the medical professional directly in connection with the Program, and that they have made the Patient aware that de-identified Patient data may be used and shared with such third parties, for purposes which include contacting their medical professional directly in connection with the Program. A list of third party partners may be provided upon request. I attest that I am authorized under applicable state law to order this test.

Medical professional signature (required)	Date (MM/DD/YYYY)