ARUP LABORATORIES

A nonprofit enterprise of the University of Utah and its Department of Pathology

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fax: 801-584-5249 | aruplab.com

THIS IS NOT A TEST REQUEST FORM. Please complete and submit with the test request form or electronic packing list.

GENOME SEQUENCING INTAKE FORM

Failure to provide required information for genome sequencing will result in suboptimal clinical reports and delays in testing.

REQUIRED for Rapid Genome Sequencing (3019947) or Genome Sequencing (3019943):

1. **Patient (Proband) Name:** _____ **Date of Birth:** _____
2. **Suspected Clinical Diagnosis:** _____

   _____

   Provide medical records detailing the patient's phenotype/relevant previous testing/family history or complete the Additional Clinical Information section found in this document.
3. **Submit Parental/Familial Comparator Specimens Using Test Codes Below. Comparator specimens should be submitted at the same time as the patient's specimen to ensure best possible turnaround time. Comparator specimens MUST be submitted within 3 days of the patient's specimen for Rapid Genome Sequencing and within 7 days of the patient's specimen for Genome Sequencing to be included in the analysis.**

   Comparators REQUIRED for Rapid Genome Sequencing (3019947)
   Rapid Genome Sequencing, Familial Comparator (3019953)

   Comparators RECOMMENDED for Genome Sequencing (3019943)
   Genome Sequencing, Familial Comparator (3019951)

   a. **Maternal Last Name, First Name**: _____
      Date of birth: _____ Clinically affected? ☐ No ☐ Yes: _____
   b. **Paternal Last Name, First Name**: _____
      Date of birth: _____ Clinically affected? ☐ No ☐ Yes: _____
   c. **Additional Familial Comparator (if applicable) Last Name, First Name:** _____

      Relationship to patient: _____

      Date of birth: _____ Clinically affected? ☐ No ☐ Yes: _____

4. **Ordering Provider Attestation of Informed Consent (Signature Required Below)**

Test Purpose and Description

The purpose of whole genome sequencing is to identify the genetic variant(s) causing a suspected genetic condition. Testing requires collecting 2 mL of blood or saliva from which the DNA is extracted. DNA codes for genes. Most of the patient's genes will be sequenced. Thousands of DNA variants will be detected by sequencing. DNA variants may be disease causing or harmless; however, for many DNA variants, their effect is not currently known.

Ordering Considerations

Participation in whole genome sequencing is voluntary. Genetic counseling is recommended before and after this complex test.

The chance a cause for the patient's medical issue(s) can be determined using this test varies and is influenced by the specific clinical features present. Diagnostic rates are highest when biological parents' specimens are included as comparators for whole genome sequencing. Parental sequence data is used to identify de novo (new) changes in the patient's DNA, not found in either parent, that could explain the patient's clinical presentation.

It is important that familial biological relationships are accurately stated because undisclosed adoption or uncertain parentage will impact result interpretation and decrease the chance of identifying causative disease variant(s).

Whole genome sequencing may identify genetic findings unrelated to the original reason for testing such as:

- Predicting another family member has, is at risk for, or

is a carrier of an unsuspected genetic condition.

- Revealing nonparentage (at least one of the persons stated to be the biological mother or father is not, in fact, a biological parent).
- Indicating the biological parents of the patient are close blood relatives (consanguineous).

Reporting of Results

Results are generally available in 1 week for rapid whole genome sequencing and within 3 weeks for nonrapid whole genome sequencing. Variants that are known or suspected to be causative for the patient's current medical issues are reported.

All variants identified in the patient that are related to the patient's primary disorder will be tested in familial controls. The status of all primary variants tested in controls will be indicated on the patient's report.

For nonrapid genome sequencing, candidate variants that are not known to be causative for the patient's current medical issues, such as de novo variants (not inherited from either parent), or variants inherited from both parents involving the same gene (suspected biallelic, autosomal recessive variants), may be reported even if the function of the gene or genetic variant is unknown.

Variants involving genes unrelated to the patient's current medical condition are generally not reported except for disease-causing secondary findings (see the Secondary Findings section below).

Because genetic knowledge is advancing at a rapid pace, reanalysis of whole genome sequencing data should be considered 12-18 months after testing is complete if a cause for the patient's condition remains undetermined. ARUP will perform reanalysis (ARUP test code 3005939) of whole genome data for a fee. If the report is amended, the ordering client will receive an updated report.

Limitations

Although genetic test results are usually accurate, several sources of error are possible, including clinical misdiagnosis of a condition, specimen mislabeling or contamination, blood transfusion, bone marrow transplantation, maternal cell contamination of cord blood specimens, or inaccurate information regarding biological relationships. If biological relationships are inaccurately reported, it could lead to an incorrect diagnosis or inconclusive result. ARUP will attempt to contact the referring provider if genetic relationship discrepancies are detected to discuss the finding and determine reporting preferences. If the provider cannot be reached in a timely manner, data from the individual with the detected relationship discrepancy will be omitted from analysis and reporting. Standard charges will apply for all specimens sequenced and a secondary findings report will still be issued if elected on the intake form.

Whole genome sequencing may be unable to identify the cause of a patient's clinical presentation. Negative results do not exclude the possibility that the patient has a genetic condition.

Some disease-causing variants may involve genes with currently unknown function that may later be determined to be disease associated, while others may not be identifiable using this test.

Secondary Findings

The American College of Medical Genetics and Genomics (ACMG) recommends reporting disease-causing variants involving specific genes that increase the risk for developing cancer, cardiovascular disorders, metabolic disorders, problems with anesthesia, retinopathy, and other conditions where monitoring or early treatment may be available. Please refer to the latest version of the ACMG recommendations for reporting secondary findings (SFs) in clinical whole genome sequencing for a list of genes and associated disorders. Additional medically actionable variants involving genes outside of the ACMG SFs list, which do not overlap with submitted clinical findings and phenotypes (non-ACMG SFs), may be reported at ARUP'S discretion for individuals who have not opted out of SF reporting.

If a patient has symptoms of a condition related to an ACMG SFs recommended gene, separate testing should be ordered, as coverage of ACMG SFs genes may be suboptimal using this test. Only variants in ACMG SFs genes identified by routine genome sequencing are reported. Single disease-causing variants in ACMG SFs genes with recessive inheritance are not generally reported.

Secondary findings will be reported for the patient and all tested familial comparators unless "opt-out" is selected for the individual on this form.

Secondary findings will be reported for familial comparators regardless of whether the finding was also identified in the patient. Parental inheritance of SFs identified in the patient will be included in the patient's report unless the positive parent opts out of receiving SFs.

If a disease-causing genetic variant is identified, insurance rates, the ability to obtain disability and life insurance, and employability could be affected. The Genetic Information Nondiscrimination Act of 2008 extends some protections against genetic discrimination (genome.gov/10002328). All test results are released to the ordering healthcare provider and those parties entitled to them by federal, state, and local laws.

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GENOME SEQUENCING INTAKE FORM

Access to Sequence Data/Data Sharing/Specimen Storage

ARUP Laboratories will have access to the patient's sequence data from whole genome sequencing. Your healthcare provider and the hospital that submitted the test to ARUP can also request a copy of the sequence data.

Because ARUP is not a storage facility, specimens may be discarded once testing is complete. Original or derivative samples from patient testing may be used for internal test validation, research, and/or training purposes. All samples are deidentified before use outside of clinical testing. You may request disposal of your specimen by calling ARUP Laboratories at 800-242-2787 ext. 3301.

In cooperation with the National Institutes of Health's effort to improve understanding of specific genetic variants, ARUP submits HIPAA-compliant, deidentified (cannot be traced back to the patient) genetic test results and health information to public databases. The confidentiality of each specimen is maintained. If you prefer that your deidentified variant data not be shared, call ARUP at 800-242-2787 ext. 3301.

Your deidentified information will not be disclosed to public databases after your request is received, but a separate request is required for each genetic test.

Additionally, patients have the opportunity to participate in patient registries and research. To learn more, visit www.aruplab.com/genetics

Ordering Healthcare Provider, Genetic Counselor: 1) I attest that I am the ordering health care provider or certified genetic counselor; 2) I have explained the purpose/benefits and limitations of the test to the patient or their legal guardian and all persons submitting comparator specimens; 3) The patient/legal guardian and all persons submitting comparator specimens were offered copies of this document; 4) I have answered all their questions regarding the purpose of the test, the reporting of primary and secondary findings, the use and retention of specimens, and data sharing; 5) I have discussed with the patient, or their legal guardian, and all familial comparators the option to receive secondary findings and have marked the election(s) accordingly below.

Ordering Provider/Genetic Counselor Printed Name **Signature** **Date**

Secondary findings identified WILL be examined and reported for the patient and comparators UNLESS the corresponding opt-out box is checked below.

☐ Opt out of reporting secondary findings for the PATIENT

☐ Opt out of reporting secondary findings for the MATERNAL COMPARATOR

☐ Opt out of reporting secondary findings for the PATERNAL COMPARATOR

☐ Opt out of reporting secondary findings for ADDITIONAL FAMILIAL COMPARATOR (Name(s):_____)

For questions, contact an ARUP genetic counselor at 800-242-2787 ext. 2141.

Additional Clinical Information

Please provide medical records detailing the patient's phenotype/relevant previous testing/family history or complete the Additional Clinical Information section below. The ability to identify causative variant(s) for the patient's presentation is influenced by the quality of the clinical information provided.

Ordering Provider: _____ Provider's Phone: _____

Practice Specialty: _____ Provider's Fax: _____

Genetic Counselor: _____ Counselor's Phone: _____

Ethnicity/Ancestry: ☐ African American/Black ☐ Asian ☐ Hispanic or Latino ☐ White ☐ Other:_____

Genes of Interest: _____

Family History:_____

NOTE: If you would like ARUP to comment on the presence/absence and inheritance of any previously identified variant(s) in the proband/family, please note the specific gene(s)/variant(s) of interest, who they were identified in, and provide a copy of the prior laboratory report (required): _____

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GENOME SEQUENCING INTAKE FORM

PRE/PERINATAL

- ☐ 0000776 Congenital diaphragmatic hernia
- ☐ 0000476 Cystic hygroma
- ☐ 0002084 Encephalocele
- ☐ 0010945 Fetal pyelectasis
- ☐ 0007430 Generalized edema
- ☐ 0001789 Hydrops fetalis
- ☐ 0010880 Increased nuchal translucency
- ☐ 0001511 Intrauterine growth restriction
- ☐ 0006579 Jaundice, neonatal
- ☐ 0002475 Myelomeningocele/spina bifida
- ☐ 0001562 Oligohydramnios
- ☐ 0001539 Omphalocele
- ☐ 0001561 Polyhydramnios
- ☐ 0001622 Prematurity–GA at birth
- ☐ 0003026 Short long bones
- ☐ 0001518 Small for gestational age
- ☐ _____

STRUCTURAL BRAIN ABNORMALITIES

- ☐ 0002134 Abnormality of basal ganglia
- ☐ 0002363 Abnormality of the brain stem
- ☐ 0001273 Abnormality of corpus callosum
- ☐ 0002269 Abnormality of neuronal migration
- ☐ 0007360 Aplasia/hypoplasia of the cerebellum
- ☐ 0012444 Brain atrophy
- ☐ 0007266 Cerebral dysmyelination
- ☐ 0006808 Cerebral hypomyelination
- ☐ 0002500 Cerebral white matter abnormality
- ☐ 0002308 Chiari malformation
- ☐ 0002539 Cortical dysplasia
- ☐ 0002282 Heterotopia
- ☐ 0001360 Holoprosencephaly
- ☐ 0000238 Hydrocephalus
- ☐ 0002415 Leukodystrophy
- ☐ 0002352 Leukoencephalopathy
- ☐ 0001339 Lissencephaly
- ☐ 0002126 Polymicrogyria
- ☐ 0002119 Ventriculomegaly
- ☐ _____

NEUROLOGICAL

- ☐ 0100022 Abnormality of movement
- ☐ 0001284 Areflexia
- ☐ 0001251 Ataxia
- ☐ 0002015 Dysphagia
- ☐ 0001332 Dystonia
- ☐ 0100660 Dyskinesia
- ☐ 0200134 Epileptic encephalopathy
- ☐ 0001298 Encephalopathy
- ☐ 0001347 Hyperreflexia
- ☐ 0004305 Involuntary movements
- ☐ 0001250 Seizures
  - ☐ 0002121 Absence
  - ☐ 0002373 Febrile
  - ☐ 0007359 Focal
  - ☐ 0002123 Generalized myoclonic
  - ☐ 0010818 Generalized tonic
  - ☐ 0011169 Generalized clonic
  - ☐ 0012469 Infantile
  - ☐ 0002069 Tonic-clonic
- ☐ _____

METABOLIC

- ☐ 0040081 Abnormal CK
- ☐ 0001941 Acidosis
- ☐ 0003234 Decreased plasma carnitine
- ☐ 0003348 Hyperalaninemia
- ☐ 0001943 Hypoglycemia
- ☐ 0001987 Hyperammonemia
- ☐ 0002490 Increased CSF lactate
- ☐ 0003542 Increased serum pyruvate
- ☐ 0001946 Ketosis
- ☐ 0003128 Lactic acidosis
- ☐ 0001942 Metabolic acidosis
- ☐ 0001992 Organic aciduria
- ☐ Abnormal newborn screen
- ☐ _____

DEVELOPMENTAL/BEHAVIORAL

- ☐ 0007018 ADHD
- ☐ 0000718 Aggressive behavior
- ☐ 0000729 Autistic spectrum disorder
- ☐ 0000722 Compulsive disorder
- ☐ 0010862 Delayed fine motor development
- ☐ 0002194 Delayed gross motor development
- ☐ 0000750 Delayed speech and language development
- ☐ 0002376 Developmental regression
- ☐ 0001263 Global developmental delay
- ☐ 0001249 Intellectual disability
  - ☐ 0002187 Profound
  - ☐ 0010864 Severe
  - ☐ 0002342 Moderate
  - ☐ 0001256 Mild
- ☐ 0000733 Motor stereotypy
- ☐ 0002360 Sleep abnormality
- ☐ 0001328 Specific learning disability
- ☐ _____

MUSCULOSKELETAL

- ☐ 0002804 Arthrogryposis multiplex congenita
- ☐ 0003199 Decreased muscle mass
- ☐ 0001371 Flexion contracture
- ☐ 0001528 Hemihypertrophy
- ☐ 0001252 Hypotonia
- ☐ 0001276 Hypertonia
- ☐ 0001382 Joint hypermobility
- ☐ 0002808 Kyphosis
- ☐ 0040064 Limb abnormality
- ☐ 0001324 Muscle weakness
- ☐ 0003198 Myopathy
- ☐ 0001513 Obesity
- ☐ 0001548 Overgrowth
- ☐ 0010442 Polydactyly
- ☐ 0002757 Recurrent fractures
- ☐ 0004322 Short stature
- ☐ 0002652 Skeletal dysplasia
- ☐ 0001257 Spasticity
- ☐ 0001159 Syndactyly
- ☐ 0001762 Talipes equinovarus
- ☐ 0000098 Tall stature
- ☐ 0000925 Vertebral column abnormality
- ☐ _____

CRANIOFACIAL

- ☐ 0000271 Abnormal facies
- ☐ 0000306 Abnormality of the nose
- ☐ 0000290 Abnormality of the forehead
- ☐ 0000175 Cleft palate
- ☐ 0410030 Cleft lip
- ☐ 0001363 Craniosynostosis
- ☐ 0000286 Epicanthus
- ☐ 0000316 Hypertelorism
- ☐ 0000601 Hypotelorism
- ☐ 0000256 Macrocephaly
- ☐ 0000252 Microcephaly
- ☐ _____

EYE AND VISION

- ☐ 0000526 Aniridia
- ☐ 0000528 Anophthalmia
- ☐ 0000618 Blindness
- ☐ 0000589 Coloboma
- ☐ 0000519 Congenital cataract
- ☐ 0000568 Microphthalmia
- ☐ 0000639 Nystagmus
- ☐ 0000648 Optic atrophy
- ☐ 0000508 Ptosis
- ☐ 0009919 Retinoblastoma
- ☐ 0000486 Strabismus
- ☐ 0000505 Visual impairment
- ☐ _____

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GENOME SEQUENCING INTAKE FORM

EAR AND HEARING

- ☐ 0000377 Abnormal external ear
- ☐ 0000405 Conductive hearing impairment
- ☐ 0000410 Mixed hearing impairment
- ☐ 0000407 Sensorineural hearing impairment
- ☐ _____

CARDIAC

- ☐ 0001713 Abnormal cardiac ventricle
- ☐ 0006695 AV Canal defect
- ☐ 0002616 Aortic root dilatation
- ☐ 0011675 Arrhythmia
- ☐ 0001631 Atrial septal defect
- ☐ 0001647 Bicuspid aortic valve
- ☐ 0001638 Cardiomyopathy
- ☐ 0001680 Coarctation of aorta
- ☐ 0001642 Pulmonary stenosis
- ☐ 0001636 Tetralogy of Fallot
- ☐ 0001629 Ventricular septal defect
- ☐ _____

RESPIRATORY

- ☐ 0002104 Apnea
- ☐ 0002883 Hyperventilation
- ☐ 0002791 Hypoventilation
- ☐ 0008751 Laryngeal cleft
- ☐ 0001601 Laryngomalacia
- ☐ 0002205 Recurrent respiratory infections
- ☐ 0002878 Respiratory failure
- ☐ 0002093 Respiratory insufficiency
- ☐ 0002107 Pneumothorax
- ☐ 0002206 Pulmonary fibrosis
- ☐ 0002575 Tracheoesophageal fistula
- ☐ 0002779 Tracheomalacia
- ☐ _____

GASTROINTESTINAL

- ☐ 0002251 Aganglionic megacolon
- ☐ 0002910 Elevated hepatic transaminase
- ☐ 0001508 Failure to thrive
- ☐ 0011968 Feeding difficulties
- ☐ 0001543 Gastroschisis
- ☐ 0001399 Hepatic failure
- ☐ 0002240 Hepatomegaly
- ☐ 0002021 Pyloric stenosis
- ☐ 0001744 Splenomegaly
- ☐ 0002013 Vomiting
- ☐ _____

GENITOURINARY

- ☐ 0000812 Abnormal internal genitalia
- ☐ 0000062 Ambiguous genitalia
- ☐ 0000028 Cryptorchidism
- ☐ 0000085 Horseshoe kidney
- ☐ 0000126 Hydronephrosis
- ☐ 0000047 Hypospadias
- ☐ 0008738 Partially duplicated kidney
- ☐ 0000113 Polycystic kidney dysplasia
- ☐ 0000107 Renal cyst
- ☐ 0000104 Renal agenesis
- ☐ 0000089 Renal hypoplasia
- ☐ 0000069 Ureter abnormality
- ☐ 0000795 Urethra abnormality
- ☐ _____

SKIN AND HAIR

- ☐ 0008066 Blistering of skin
- ☐ 0000957 Café-au-lait spot
- ☐ 0005306 Capillary hemangioma
- ☐ 0001595 Hair abnormality
- ☐ 0000974 Hyperextensible skin
- ☐ 0000953 Hyperpigmentation of skin
- ☐ 0000998 Hypertrichosis
- ☐ 0001010 Hypopigmentation of skin
- ☐ 0008066 Ichthyosis
- ☐ 0001597 Nail abnormality
- ☐ 0001581 Recurrent skin infections
- ☐ _____

HEMATOLOGY AND IMMUNOLOGY

- ☐ 0001928 Abnormality of coagulation
- ☐ 0004432 Agammaglobulinemia
- ☐ 0001903 Anemia
- ☐ 0031020 Bone marrow hypercellularity
- ☐ 0001878 Hemolytic anemia
- ☐ 0002721 Immunodeficiency
- ☐ 0001888 Lymphopenia
- ☐ 0001875 Neutropenia
- ☐ 0001876 Pancytopenia
- ☐ 0002719 Recurrent infections
- ☐ 0004430 Severe combined immunodeficiency
- ☐ 0001873 Thrombocytopenia
- ☐ _____

ENDOCRINE

- ☐ 0000834 Abnormality of adrenal glands
- ☐ 0008226 Androgen insufficiency
- ☐ 0008258 Congenital adrenal hyperplasia
- ☐ 0000819 Diabetes mellitus
- ☐ 0000873 Diabetes insipidus
- ☐ 0001738 Exocrine pancreatic insufficiency
- ☐ 0000821 Hypothyroidism
- ☐ 0000829 Hypoparathyroidism
- ☐ _____

CANCER

- ☐ Type of cancer _____
- ☐ Age at diagnosis _____
- ☐ Family history of cancer and affected relatives

_____

_____

OTHER

_____

_____

_____

_____

_____

_____

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GENOME SEQUENCING INTAKE FORM

PREVIOUS TESTING (provide copy of abnormal results)

Prenatal cfDNA screen: ☐ Not performed ☐ Normal ☐ Abnormal for: ☐ T21 ☐ T18 ☐ T13 ☐ Turner syndrome ☐ XXX ☐ XXY ☐ XYY

☐ Other (specify): _____

Echocardiogram:	☐ Not performed	☐ Normal	☐ Abnormal _____
EEG:	☐ Not performed	☐ Normal	☐ Abnormal _____
EMG/NCV:	☐ Not performed	☐ Normal	☐ Abnormal _____
Gene testing: _____		☐ Normal	☐ Abnormal _____
Gene testing: _____		☐ Normal	☐ Abnormal _____
Karyotype:	☐ Not performed	☐ Normal	☐ Abnormal
Prenatal genomic microarray:	☐ Not performed	☐ Normal	☐ Abnormal _____
Postnatal genomic microarray:	☐ Not performed	☐ Normal	☐ Abnormal _____
MRI (brain):	☐ Not performed	☐ Normal	☐ Abnormal _____
MRI (other):	☐ Not performed	☐ Normal	☐ Abnormal _____
CT (brain):	☐ Not performed	☐ Normal	☐ Abnormal _____
CT (other):	☐ Not performed	☐ Normal	☐ Abnormal _____
Muscle biopsy:	☐ Not performed	☐ Normal	☐ Abnormal _____
Ultrasound	☐ Not performed	☐ Normal	☐ Abnormal _____
X-ray:	☐ Not performed	☐ Normal	☐ Abnormal _____
Other test: _____		☐ Normal	☐ Abnormal _____
Other test: _____		☐ Normal	☐ Abnormal _____
Other test: _____		☐ Normal	☐ Abnormal _____

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