Chromosome Analysis
also known as: Cytogenetics, Karyotyping, G-bands

TEST DESCRIPTION:
Conventional cytogenetics (chromosome analysis) analyze the whole genome in a single assay. Developed over 50 years ago, this assay still plays a vital role in postnatal diagnostics because it allows for simultaneous characterization of chromosome number and structure.

TEST DETAILS and COMPLEMENTARY TESTING:
• Standard methodology is used for G-banded chromosome analysis.
• This test analyzes fetal cells during a pregnancy OR after a pregnancy loss. Postnatal testing on maternal, paternal, or newborn blood specimens such as, Postnatal Chromosome Analysis, Postnatal FISH, or Postnatal Microarray, must be ordered separately.
• In conjunction with Chromosome Analysis, FISH, and/or Microarray, Amniotic Fluid AFP (AF-AFP) can be ordered on amniotic fluid samples with a gestational age of 22 weeks 6 days or less. (AChE should be ordered, instead of AF-AFP, if gestational age is 23 weeks or greater). In most situations if AF-AFP is positive, AChE will be completed. These non-genetic send-out tests can be ordered on our laboratory’s test request form, but are performed, reported, and billed by UNMC Regional Pathology Services and questions for these tests should be directed to their laboratory by calling 402-559-6420.
• Postnatal Chromosome Analysis on maternal (or paternal) blood can be ordered to identify a chromosomal rearrangement, such as a balanced translocation, found in 5-8% of individuals with recurrent pregnancy loss. 1,2

ADVANTAGES:
• Detects aneuploidy, triploidy, structural rearrangements (balanced and unbalanced), and large-scale deletions and duplications
• Whole genome analysis
• Establishes chromosomal orientation of genetic material

LIMITATIONS:
• Requires mitotic (dividing) cells, which can be problematic with pregnancy loss specimens
• Limited resolution as compared to newer technologies such as microarray
• Unable to provide gene-specific information

INDICATIONS FOR PRENATAL CHROMOSOME ANALYSIS:
• Advanced maternal age (> 35 years of age)
• Previous pregnancy with a chromosome abnormality
• Parent carrying a known translocation
• Abnormal ultrasound findings
• Abnormal first or second trimester screening test

INDICATIONS FOR PREGNANCY LOSS CHROMOSOME ANALYSIS:
At least 10-15% of all recognized pregnancies are miscarried. Chromosome abnormalities cause more than 50% of first trimester losses and 15% of second trimester losses. 3
• History of multiple spontaneous abortions without evidence of a clear reason for the loss
• Previous pregnancy with or family history of a chromosome abnormality
• Parent carrying a known translocation
SPECIMEN COLLECTION & TRANSPORT:
Complimentary test kits are available upon request, but are not required.

SAMPLE TYPE and REQUIREMENTS:
- **amniotic fluid**: 15-20 ml in sterile tube(s)
  - Additional specimen is required to perform FISH or Microarray Analysis. Refer to our Prenatal and Pregnancy Loss specimen requirements for more details.
- **chorionic villi sampling (CVS)**: 10-20 mg in tissue culture media
- **fetal fluid / urine**: 15-20 ml in sterile tube(s)
- **products of conception (POC)**: 1 cm³ (sterile) fetal tissue and/or villi in tissue culture media
  - Preferred fetal tissue sample sites include buttocks or thigh. If fetal tissue is not available placental villi can be utilized.
  - Separate villi from maternal blood and deciduas to reduce the chance for maternal cell contamination.
  - For IUFD or therapeutic abortion cases, amniotic fluid can be accepted.

SHIPPING:
- Maintain and ship samples at room temperature.
- Coordinate transport for sample to be received in our laboratory within 24-48 hours of collection.
  - **LOCAL**: Call 402-559-5070 (option 1)
  - **OUT OF AREA**: Prior to shipment, please fax the completed test request form to 402-559-7248, including the FedEx® airbill tracking number.
    - Saturday delivery MUST be checked when sending FedEx® on Friday.
    - Please include Internal Billing Reference # 3155070600 on the FedEx® airbill.
    - **Ship To**: Human Genetics Laboratory – Zip 5440
      UNMC Shipping & Receiving Dock
      601 S. Saddle Creek Road
      Omaha, NE 68106

REQUIRED FORM:  The following form can be downloaded via our website.
- Prenatal and Pregnancy Loss Test Request Form

OPTIONAL FORM:
- Informed Consent for Genetic Testing

POTENTIAL TEST RESULTS:

NORMAL RESULTS:
- A normal result indicates no clinically-significant chromosome abnormalities were identified.
  - 46,XX (female)
  - 46,XY (male)

ABNORMAL RESULTS:
- An abnormal result indicates that a chromosome abnormality was identified that likely provides an explanation for the clinical indications.
  - Parental testing (Postnatal Chromosome Analysis on maternal and/or paternal blood) may be recommended in order to clarify whether the result is de novo or familial for the purpose of recurrence risk calculation.
- **Deletion**: Missing pieces of chromosomes and/or genetic material. Some may be small and difficult to detect.
- **Duplication**: Extra genetic material which may be present on any chromosome, such as the presence of two horizontal bands at a specific location instead of one.
- **Monosomy**: The absence of one whole chromosome. This includes Turner syndrome, a female with a single X chromosome (45,X) instead of 46,XX. Most other monosomies are not compatible with life.
- **Rearrangement**: Genetic material is present on a chromosome but not in its usual location.
• **Translocation:** Translocations result when pieces of chromosomes break off and reattach to another chromosome. If it is a one-to-one switch and all of the genetic material is present (but in the wrong place), it is said to be a balanced translocation. If it is not, then it is called an unbalanced translocation.

• **Trisomy:** The presence of an extra chromosome; a third instead of a pair. These include Trisomy 21 (Down syndrome), Trisomy 13 (Patau syndrome), Trisomy 18 (Edwards syndrome), and Klinefelter syndrome, a male with an extra X chromosome (47,XXY) instead of 46,XY, and other less common trisomies.

• In some circumstances, a result will be unavailable.

**TURN-AROUND-TIMES:** Results are typically available in 7-10 days on amniotic fluid, CVS, and fetal fluid/urine; 10-14 days on POC.

**BILLING:** Our laboratory offers patient/self-pay, insurance (including Medicare/Medicaid), and client/institution billing options. Verifying coverage requirements or obtaining preauthorization PRIOR TO OR AT THE TIME OF SPECIMEN COLLECTION is often necessary. We provide preauthorization services upon request by calling 402-559-5070 (option 3); the following forms are helpful for obtaining the information required by insurance providers and can be downloaded via our website.

- Request for Insurance Pre-Authorization

In some circumstances, a test may be warranted even though insurance coverage is denied or not guaranteed. For these situations, we request the following form be signed by the patient and submitted with the sample. This helps inform patients of their potential financial responsibility, should the costs of genetic testing not be paid by their insurance provider.

- Advanced Beneficiary Notice of Noncoverage (ABN) – required when billing Medicare

**CPT CODES:** Though some may not be billed, we recommend submitting all listed codes (for sample type being sent) for preauthorization.

- amniotic fluid: 88235, 88267, 88269, 88280, 88285
- CVS: 88235, 88261, 88262, 88280, 88285
- fetal fluid: 88235, 88261, 88262, 88280, 88285
- POC: 88233, 88261, 88262, 88280, 88285

**PRICING:** For current costs contact the laboratory billing staff at 402-559-5070 (option 3).

**RESOURCES:** The following resources can be downloaded via our website, or you may request brochures for your clinic by contacting our marketing specialist at 402-559-6935 | humangenetics@unmc.edu.

- PATIENT BROCHURE: Amniocentesis (English)
- PATIENT BROCHURE: Amniocentesis (Spanish)
- PATIENT BROCHURE: CVS (English)
- PATIENT BROCHURE: CVS (Spanish)

**REFERENCES:**

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