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NONINVASIVE PRENATAL ANEUPLOIDY SCREENING TEST

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3003043 Non-Invasive Prenatal Aneuploidy Screen by Cell-Free DNA Sequencing

Noninvasive prenatal testing (NIPT), also referred to as noninvasive prenatal screening (NIPS) or cell-free DNA (cfDNA) screening, screens for specific chromosomal aneuploidies in the fetus and may be performed from 10 weeks of gestation through the third trimester. It is the most sensitive and specific aneuploidy screening test.

The American College of Obstetricians and Gynecologists (ACOG), American College of Medical Genetics and Genomics (ACMG), and Society for Maternal-Fetal Medicine (SMFM) recommend that healthcare providers discuss prenatal genetic screening and diagnostic options with all pregnant women, regardless of maternal age or fetal risk of chromosomal abnormality.[1,2,3] ARUP offers both NIPT and maternal serum screening, as well as comprehensive prenatal diagnostic options.

Conditions and characteristics screened by NIPT:

- Trisomy 21 (Down syndrome)
- Trisomy 18 (Edwards syndrome)
- Trisomy 13 (Patau syndrome)
- Monosomy X (Turner syndrome)
- XXY (Klinefelter syndrome)
- XXX (Triple X syndrome)
- XYY
- Fetal sex (patient may opt out)

ARUP offers genetic counselor support to providers to help them understand NIPT and its applications. The Prenatal Testing for Chromosomal Abnormalities and Neural Tube Defects topic on ARUP Consult provides detailed information about recent clinical practice guidelines, the advantages and disadvantages of testing choices, and recommendations for discussing these complex options with patients.

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Prenatal Testing for Chromosomal Abnormalities and Neural Tube Defects

ARUP NIPT reports emphasize the screening nature of this test and are designed with a focus on clarity and brevity. Reports provide a clear summary of the high- or low-risk screening result, with recommendations for follow-up. Important details such as positive predictive value, negative likelihood ratio, and relevant data from multicenter studies may be included. The enhanced reports also provide helpful resources for both patients and healthcare professionals. Fetal fraction is listed unless testing does not yield a result. In cases without results, an explanation of possible cause(s) and recommendations are included.

Which NIPT platform does the ARUP NIPT utilize?

ARUP's NIPT analysis utilizes a massively parallel whole genome sequencing method developed by Illumina (Verinata).[4] The likelihood of aneuploidy is based on an over- or underrepresentation of interrogated chromosomes.

Healthcare providers with questions may contact an ARUP genetic counselor at 800-242-2787 ext. 2141.

Performance of NIPT

In 2017, a well-respected meta-analysis of NIPT performance found that "there was no obvious difference in performance" between the four methodologies used for cfDNA prenatal aneuploidy screening.[5] Multiple large studies have demonstrated that the Illumina NIPT platform is robust, and ARUP has validated every aspect of the NIPT testing process.[6,7,8] The analytic validation accuracy study results demonstrate that ARUP NIPT analysis and interpretation are consistent with the accuracy reported in large data sets published based on clinical studies utilizing this platform. Detailed information about test performance can be found in the Noninvasive Prenatal Aneuploidy Screen by Cell-Free DNA Sequencing Test Fact Sheet.

Spotlight on

Noninvasive Prenatal Testing (NIPT)

Shelly Bosworth, MS, LCGC

aruplab.com/nipt22

Why choose ARUP for NIPT?

- Dependable quality from a well-established, nonprofit, university-affiliated national reference laboratory
- Support provided to clinicians and clients by an integrated team of board-certified laboratory geneticists and genetic counselors, who specialize in prenatal genetics and who can aid providers in test selection and results interpretation
- Opportunity for integration with a comprehensive test menu that includes a suite of testing related to women's health (e.g., carrier screening, maternal serum screening, prenatal screening by NIPT, and prenatal diagnostic testing)
- Succinct, clear reports that include recommendations and data to support providers
- Integration with the healthcare system
  - Results that interface with EMR and have links to enhanced reports
  - Straightforward billing consistent with nongenetic lab tests
  - Standard processing and sendout of samples, consistent with other sendout lab orders

Published Clinical Sensitivity and Specificity[a,b]

Condition	Clinical Sensitivity	Clinical Specificity	PPV[c]	NPV
Trisomy 21	98.9%	99.7%	20.9-95.1%	>99.9%
Trisomy 18	>99.9%	99.8%	6.2-94.1%	>99.9%
Trisomy 13	>99.9%	99.8%	1.6-76.8%	>99.9%
Monosomy X	>99.9%	>99.8%	—	—

[a] Male/female concordance is >99%.

[b] Data are not sufficient to calculate sensitivity, specificity, PPV, and NPV for every condition.

[c] PPV ranges are calculated based on sensitivity and specificity in Borth et al (2021)[8] and the prevalence in a low-risk group (20 years of age, 30 weeks gestational age) through the prevalence in a high-risk group (44 years of age, 10 weeks gestational age).[9,10] PPV is greatly affected by an individual's pretest risk for each of the screened conditions, which varies based on gestational age and maternal age.

NPV, negative predictive value; PPV, positive predictive value

Detailed information about PPV at increased pretest risk levels, various gestational ages, and maternal ages can be found in the supplementary tables.

For more information about NIPT, visit: **aruplab.com/nipt22**

References

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