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Cell-Free Fetal DNA (CFF DNA) - In the Maternal Circulation (Indication of Placental Health and Disease)

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ABSTRACT

In human pregnancy, the constant turnover of villous trophoblast results in extrusion of apoptotic material into the maternal circulation. This material includes cell-free (cf) DNA, which is commonly referred to as "fetal", but is actually derived from the placenta. As the release of cf DNA is closely tied to placental morphogenesis, conditions associated with abnormal placentation, such as preeclampsia, are associated with high DNA levels in the blood of pregnant women. Over the past five years, the development and commercial availability of techniques of massively parallel DNA sequencing have facilitated noninvasive prenatal testing (NIPT) for fetal trisomies 13, 18, and 21. Clinical experience accrued over the past two years has highlighted the importance of the fetal fraction (ff) in cf DNA analysis. The ff is the amount of cell-free fetal DNA in a given sample divided by the total amount of cell-free DNA. At any gestational age, ff has a bell-shaped distribution that peaks between 10 and 20% at 10–21 weeks. ff is affected by maternal body mass index, gestational age, fetal aneuploidy, and whether the gestation is a singleton or multiple. In approximately 0.1% of clinical cases, the NIPT result and a subsequent diagnostic karyotype are discordant; confined placental mosaicism has been increasingly reported as an underlying biologic explanation. Cell-free fetal DNA is a new biomarker that can provide information about the placenta and potentially be used to predict clinical problems. Knowledge gaps still exist with regard to what affects production, metabolism, and clearance of feto-placental DNA.

Keywords: Cell-free fetal DNA, Noninvasive prenatal testing (NIPT), Confined placental mosaicism, Aneuploidy, Placenta, Fetal Fraction(ff), feto-placental DNA

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