response, which is a necessary first step for providing individualized immunosuppressive therapy to transplant recipients.

CELL-FREE DNA IN PRENATAL MEDICINE

Fetal genetic disorders are among the leading causes of stillbirth, neonatal death, and long-term developmental delay. Prenatal diagnosis of fetal genetic conditions relies on invasive sampling of fetal tissues via either amniocentesis (sampling of amniotic fluid) or chorionic villus sampling (CVS; sampling of placental tissue). Prenatal diagnostic tests are invasive, ultrasound-guided, needle-based procedures that unfortunately carry a small risk of miscarriage, preterm rupture of the membranes, and preterm birth. Historically, safer noninvasive screening for fetal genetic disorders, particularly aneuploidy (chromosomal copy number abnormalities such as trisomy 21 or Down's syndrome), was performed by combining maternal serum analyte levels (e.g., pregnancy-associated plasma protein A [PAPP-A], β-human chorionic gonadotropin [β-hCG], α-fetoprotein [AFP], inhibin) with sonographic assessment of the fetal nuchal translucency (a measurement of the distance between the scalp and skin in the area of the fetal neck). While traditional prenatal screening is safer than invasive diagnostic tests, these modalities suffer from lower detection rates and higher false-positive rates. Recent advances in cell-free fetal DNA technology have introduced safe noninvasive prenatal tests with much higher accuracy than traditional screening. This section describes the use of cell-free fetal DNA testing in prenatal medicine.

■ NONINVASIVE PRENATAL TESTING FOR FETAL ANEUPLOIDY

Passage of fetal cells into the maternal bloodstream was initially described almost 80 years ago. A mismatch between fetal red blood cells and maternal red blood cells was subsequently identified as the cause of isoimmunization and hydrops fetalis, a potentially lethal condition in which maternal antibodies develop against "foreign" fetal red blood cell antigens. With the development of Rho(D) immune globulin (RhoGAM) and its use to prevent RhD isoimmunization in RhD-negative mothers carrying RhD-positive pregnancies, attention