

# FETAL DRUG EFFECTS

**E**ach year about 500,000 unborn children are exposed to psychoactive drugs. The medical, psychosocial and economic consequences of perinatal drug exposure are a problem of catastrophic magnitude, not just for these unwilling participants, but to society at large.

The pernicious relationship between drug use and birth defects has been known since ancient times. For example, the biblical book of Judges (13:7), it warns about alcohol use during pregnancy. However, it was not until the late 1950's, when pregnant women began taking Thalidomide, a sedative hypnotic drug that caused limb defects in the fetus, that the irreversible consequences of drug use during pregnancy garnered public attention.

## ALCOHOL

More than a decade later, the term Fetal Alcohol Syndrome (FAS) was used to describe a constellation of symptoms found in the children of mothers who drank heavily during pregnancy. The physical features of FAS include: craniofacial anomalies such as small head circumference, epicanthal folds, small palpable fissures, maxillary hypoplasia, thin upper lip, and an indistinctiltrum. Overall FAS babies are smaller in size than non-alcohol exposed infants. About half of all FAS children have some degree of mental retardation (IQs  $\leq 70$  or less). The physical features of FAS become less distinct with age, but the psychological characteristics (e.g., lack of reciprocal relationships, poor impulse control, mental retardation) do not.

Conservative estimates suggest that about 3-4 children are born with FAS each day. About 10-15 times as many children are born with a diagnosis of Fetal Alcohol Effects (FAE), a term used when the full blown morphological features of FAS are not present, but alcohol use during pregnancy and behavioral disorders have been confirmed. In animals, single doses of alcohol can produce many of the features of FAS, probably due to cranial neural crest cell death or a decreased availability of biochemical factors necessary for normal development. Single dose cases have not been documented in humans, but there is no known safe dose of alcohol that can be consumed during pregnancy.

## COCAINE

It is estimated that each day about 250-650+ fetuses are exposed to cocaine or other drugs. Based on urine testing at birth and/or maternal history, some studies of inner city obstetric populations have reported cocaine use as high as 11.5% in pregnant women. Since chemical testing only reflects recent drug use, not drug use throughout pregnancy and self-report data about illegal drug use may not be accurate, these estimates are probable conservative. Cocaine's low molecular weight and high solubility enable it to freely pass through the placenta. The fetus is particularly sensitive to cocaine because, in contrast to the mature organism, low levels of fetal enzymes are unable to metabolize the drug and the fetus receives the maximum effect of the mother's dose.

As a vasoconstrictor, cocaine constricts blood vessels and decreases blood flow which decreases the supply of oxygen to organs. In animal studies, fetal hypoxia produces growth retardation and congenital malformations. In humans, *in-utero* cocaine exposure results in growth retardation, decreased head size, and increased risk for *abruptio placentae* (premature separation of the placenta from the uterus), premature birth and in some cases, death. Cocaine increases fetal heart rate and blood pressure which may contribute to cerebral hemorrhaging, infarctions and other pregnancy complications. Cocaine-induced congenital malformations in humans are not well documented or consistent. The term "fatal vascular disruption" has been offered to explain the array of observed cocaine-related malformations. At birth, babies born of cocaine-abusing mothers are smaller in size, usually premature, and require neonatal intensive care. They have poor visual processing of faces and objects, abnormal sleep patterns, tremors, poor feeding and transient central nervous system irritability. The long-term effects in these babies as they grow are not known.

## MARIJUANA and TOBACCO

Evidence is accumulating that the use of marijuana during pregnancy increases the risk for premature birth, small birth size (weight, length and head circumference) and delayed development. To date, most studies reveal no clear relationship between maternal marijuana use and physical birth defects in humans, although some defects have been reported, (e.g., craniofacial features similar to FAS).

At birth, marijuana-exposed infants tend to have poorer habituation to visual stimuli, fine tremors and increased startle responses to spontaneous and mild stimuli. Although by 12 months of age, mental, visual and motor performance is not significantly correlated with maternal use of marijuana the more subtle, long-term effects use are not yet known. As with marijuana, use of tobacco during pregnancy is causally associated with lower birth weights and premature delivery, possibly due to decreased tissue oxygenation resulting from the formation of carboxyhemoglobin. Carboxyhemoglobin indirectly decreases the release of oxygen from the oxygen-carrying red blood cells.

## HEROIN AND METHADONE

Pregnant heroin addicted women give birth to infants that are smaller in overall size and head circumference than controls. There is some evidence that small head size predicts greater risk for complications during pregnancy and birth, regardless of the sex or birth weight of the child.

Methadone is used to treat heroin addicts and is a relatively safe alternative to relapse, heroin addiction or withdrawal, but it is still an opiate narcotic. Methadone-exposed infants have poorer fine and gross motor coordination at birth. By age 5, these children are more active, engage in task irrelevant activity and have poorer fine-motor coordination than controls. There are conflicting reports regarding the effects of prenatal opioid exposure on cognitive development in toddlers and preschoolers. Observations of delayed mental and motor development may be due to poor environmental conditions or methadone may produce subtle neurological changes making children more susceptible to the developmental delays associated with impoverished environments.

## SUMMARY

Drug use during pregnancy places the fetus at risk for birth defects ranging from gross dysmorphology to behavioral disorders to mental retardation. Alcohol, cocaine, opiate, marijuana or tobacco use during pregnancy decreases birth weight and size and increases neonatal intensive costs. Together, the overall emotional, societal and medical economic cost of drug use during pregnancy clearly advocates for prevention through abstinence or intervention through education of both clinicians and prospective parents.

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