

# Impact of teratogens affecting the prenatal child



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The aim of this discussion is to explore the impact of teratogens affecting the prenatal child and the interventions available to assist in preventing teratogens. For the purpose of this discussion three particular and prominent teratogens are highlighted including malnutrition, drugs which include alcohol/cigarettes and lastly exploring sexually transmitted diseases. These teratogens are highlighted because of the effects of the recession on Irish society today. A report by The Economic and Social Research Institute (ERSI) tells us that 22% of people living in households are unemployed, double the average within Europe. (ERSI 2012). The effects of this crisis includes further poverty which can lead to malnutrition and often a reliance on substances for comfort in these difficult times.

*“Knowing, is not enough, we must apply, willing is not enough, we must do.”*  
“(J. W. Von Goethe).

A teratogen, a Greek word, meaning monster is anything that creates a birth defect. (Santrock 2005). Teratology is the study of such teratogens.

Teratogens can include environmental toxins, alcohol, drugs, incompatible blood types, diseases, inadequate nutrition, stress and advanced paternal and maternal age. (Santrock 2004). Exposure to potentially hazardous agents throughout pregnancy is common. Many exposures are unavoidable, as pregnancy is often unplanned or unnoticeable for a period after conception. (Queenan et al 2010). Abnormalities in prenatal development can be an outcome from exposure to teratogens. Each organ structure is at its most vulnerable to harm when it is developing at its quickest, during the first eight weeks of pregnancy, carrying the greatest risk of exposure to

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teratogens during this critical period. If a teratogen interferes during a critical period, a certain body structure will not form correctly. (Boyd and Bee 2012).

The first twelve weeks of foetal life is a time of remarkable cellular configuration and development that is not fully understood, even to this day. By the completion of this time, the main anomalies that can affect the foetus are already in place and the sooner they occur, the more extreme the damage. There are pregnant women with the belief that everything they do has an effect on the unborn child and there are others who assume that nothing, or little, affects the unborn child. In fact, the truth is, it lies somewhere in the middle of both of these extremes. (Santrock 2005). A substantial number of already pregnant women are compromised or at risk symptomatic of things such as inappropriate nutrition, smoking, consumption of drugs and alcohol, medications, genitourinary infections, inadequate dental health and anaemia (WHO 2002).

The most important factor in development of the foetus is the mother's diet. (Carlson et al 2004). Maternal malnutrition during gestation can cause foetal growth limitations. Changes in foetal nutrition can result in developmental variations that can permanently alter the physiology and structure of the unborn child, predisposing people to endocrine, pulmonary and cardiovascular illnesses in adult life. (Lee 2011). Under normal conditions, the prenatal environment supplies the foetus with ample nutrients, this is the foetus's single source of nutrition. An insufficient diet alone can be a factor in abnormal occurrences in the developing foetus. (Carlson et al 2004). The growing foetus relies completely on its mother for the nutrients it requires.

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The nutrients are released from the mother's blood. (Santrock 2004). The reproductive system and its hormonal control structures are mainly formed in foetal life. There is an arising concern if this prenatal compromise translates into any major functional deficit in reproductive functioning in adulthood. Epigenetic and possible intergenerational effects signify an exciting section of interdisciplinary research for the development of novel nutritional methods during pre and postnatal stages ensuring reproductive well-being in adult life. Maternal malnutrition can have substantial results on the developing foetal lung, this goes through rapid cellular differentiation and multiplication just before birth. (Lee 2011).

Foetal growth is affected by the amount and the quality of maternal nutrition and the ability of the mother to aptly absorb and dispense maternal cardiorespiratory function, digested micronutrients, uterine blood flow, placental blood flow, placental transfer and suitable delivery and treatment of oxygen and nutrients by the foetus. (Queenan et al 2011).

Studies from Holland and Leningrad during World War II imply that when maternal calorie intake fell to 800 kcal per day, birth weight was reduced to 535g in Leningrad and 250g in Holland. In modern day, the urban war creates comparable stress through domestic violence, lack of social supports and drugs. In 2011, the same as 1944-5, the connection between pregnancy and maternal nutrition status relies on a moderate weak proxy for women's nutritional status, BMI (Body Mass Index). (Queenan et al 2011).

A malnourished woman during pregnancy has a larger chance of delivering a low birth weight infant who could have intellectual problems in childhood and

can be an important risk factor for mental illness as an adult. (Bee and Boyd 2012). Children who are born to malnourished mothers are more prone to having malformed offspring. (Santrock 2004). The largest impact of malnutrition appears to be on the developing nervous system. Some studies have shown severe prenatal malnutrition can even cause death in the foetus or new-born. (Bee and Boyd 2012). Folic acid (a B-complex vitamin) is very important for normal prenatal development, insufficient folic acid can be associated with neural tube defects in the unborn child, such as spina bifida. It is advisable to consume a minimum of 400 micrograms per day. It is also advisable to take a multi vitamin prior to pregnancy. (Santrock 2004). It is important for the pregnant woman to take adequate calories and protein to prevent malnutrition. (Bee and Boyd 2012).

Maternal medical conditions during pregnancy can have a vast effect on foetal development, this can be compounded by drugs, smoking and alcohol use in pregnancy. Parents using opiates or misusing alcohol may also have additional difficulties, predisposing them to their lifestyle of choice, which can include a range of mental health and neurodevelopmental health problems. Mothers abusing drugs and alcohol often do not look after themselves during pregnancy, and their chaotic lifestyles do not permit optimum health.

Fetal Alcohol Spectrum Disorder (FASD) is an umbrella term for outcomes in pregnancy in relation to alcohol, including Fetal Alcohol Syndrome (FAS), partial FAS and Alcohol related Neurodevelopmental Disorder. (Pacey 2010). Alcohol during pregnancy signifies the typical form of behavioural teratogenesis which can cause not only bodily malformations but also

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interference with development of the brain, attention control, substantial impairments in behaviour and language development. There is also an increased risk of behaviour difficulties throughout life. (Preece and Riley 2011). Studies have shown that alcohol can adversely affect the ovum before ovulation or whilst on its journey down the fallopian tube into the uterus. A zygote can also be affected by alcohol even before implantation in the uterine lining. (Bee and Boyd 2012).

Up to 50% of women in the UK continue to drink alcohol in pregnancy in spite of many advisory bodies recommending avoidance of alcohol use. The Royal College of Obstetricians and Gynaecologists state that binge drinking in early pregnancy may be of particular harm. The larger the consumption of alcohol, the greater risk. There is double the increase in small for gestational age (SGA) when the mother consumes more than 52g of alcohol per day and a 23% increase in premature birth with more than 36g of alcohol per day. A particular study of alcohol and the effects on pregnancy which included the UK, Ireland, New Zealand and Australia showed that in Ireland and the UK 65-80% of the participants consumed alcohol in pregnancy in comparison to 38% in New Zealand and Australia. (McCarthy et al 2013).

Mothers who drink heavily, or alcoholics, are at a much greater risk of delivering infants with FAS. These children are usually smaller than average, having smaller brains. They often have heart defects and loss of hearing. Their faces are characterised by a rather flat nose and a long space between the nose and the mouth. Their intelligence scores when older indicate mild mental retardation. They often have behaviour and learning difficulties that sometimes continue into adolescence and adulthood. (Boyd and Bee 2012).

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The estimated incidence of FAS in Europe is 0.4 per 1000 births. (Mullally et al 2011).

According to the British Medical Association (BMA) in 2007 FAS is the primary known source of non-genetic intellectual disability in the western world. The BMA recommends nurses make formal diagnoses of FAS in order for early intervention and programmes for treatment. Early interventions from midwives, nurses, better education from the teaching professions and more support for the families will improve life and opportunities of young people, especially moving into adulthood. (Callanan 2013). Doctors have not identified safe levels of alcohol consumption, but experts do know that FAS is preventable by not drinking any alcohol during pregnancy. It is also advisable to refrain from drinking alcohol if trying to conceive and if there is an alcohol problem, to address this before conceiving. (Mayo Clinic 2011). According to the U. S. Surgeon General, it is recommended that no alcohol is consumed during pregnancy. (Santrock 2004).

There is an association between smoking throughout pregnancy and low birth weight in infants. (Boyd and Bee 2012). The main problem with smoking is nicotine, it constricts the blood vessels, reduces nutrition and blood flow to the placenta. (Boyd and Bee 2004). The infants of mothers who smoke are on average about half a pound smaller than infants of non-smokers, the same can be said of marijuana users. (Boyd and Bee 2012). The older the smoking mother is, the higher chance of lower birth weight. (Boyd and Bee 2004). The exposure to tobacco can also have long term effects on a child's development, with larger rates of learning difficulties and behaviour problems. Moreover, there is a likelihood to be diagnosed with an

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attention deficit hyperactivity disorder. Infants of marijuana users seem to have little interest in their surroundings for approximately two weeks after birth. At age six, these children are smaller in height than six year olds who were not exposed to marijuana. (Boyd and Bee 2012).

Research shows the amount of nicotine and the severity of consequences for the unborn child. If a pregnant woman cannot quit smoking, she should at least cut back. (Boyd and Bee 2004). Some helpful ways to quit include, setting a quit date, use clove oil, this will reduce the need for a cigarette, rub a few drops onto the throat, the back of the neck or on fingertips and suck on a whole clove in order to lower cravings. The homeopathic remedy Nux vomica helps with irritability associated with the withdrawal from nicotine. (Kane 2009). Intervention programs devised to assist pregnant women discontinue smoking can help to reduce the negative effects of smoking, particularly in order to raise birth weight. (Santrock 2004). Cessation advice by health care providers, one to one, group and telephone counselling can all assist in the cessation of smoking. (Malarcher et al 2011).

#### Use of cocaine

All too often rubella and cervical cytology status is unidentified. Prenatal care and promotion is of significant importance. (WHO 2002).

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