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# Smoking and drinking in pregnancy:

## What we know and what you can do

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# Smoking and Alcohol Use in Pregnancy

- Growing Up in New Zealand cohort 2009-2011 (N=6822):
  - 20% of women smoked before pregnancy, and 10% continued to smoke throughout pregnancy.
  - 71% of women reported drinking before pregnancy (including before awareness of pregnancy), 23% during their first trimester, and 13% after their first trimester.




*Source: Cheung et al. SuPERU 2015. Humphrey et al. NZMJ 2016;129 (1422):60-74. Rossen et al. NZMJ 131 (1479):24-34*

# Teratogen

## an agent or factor which causes malformation of an embryo.

- Alcohol and tobacco products are harmful to adults, children, and the developing fetus.
- Alcohol and toxicants in cigarettes (including nicotine, carbon monoxide, and cyanide) are teratogens.

# Effect of Smoking on Pregnancy and Fetal Development

- Smoking during pregnancy is associated with adverse outcomes for both the mother and fetus:
  - Birth complications associated with placental function;
    *Castles et al. Am J Prev Med 1999; 129(4): 735-744.*
  - Adverse delivery outcomes (including NICU admission, Apgar score [<7], preterm birth, and perinatal and neonatal death);
    *Mei-Dan et al. J Perinat Med 2015; 43(5):553-558. Pineles et al. Am J Epi 2016; 184(2):87-97.*
  - Growth restriction;
    *Bird et al. Aust NZ J Obstet Gyn 2017; 57(1):16-24. Pereira et al. Nicotine Tob Res 2017; 19(5):497-505*
  - Poor respiratory health;
    *Burke et al. Ped 2012; 129(4):735-744.Silvestri et al. Ped Pul 2015; 50(4):353-362.*
  - Sudden Unexplained Death in Infancy (SUDI).
    *Anderson et al. Ped 2019; 143(4):e20183325.*

# Effect of Smoking on Pregnancy and Fetal Development

- Tobacco smoke contains more than 5000 compounds including carbon monoxide, nicotine, and at least 250 other chemicals known to be harmful. Metabolites in tobacco smoke:
    - Affect placental function;
    - Reduce uterine blood flow;
    - Reduce oxygen supply;
    - Cross the placenta and may interfere with fetal development.

*Shiverick. Reproductive and Developmental Toxicology 2017.*

# Effect of Smoking on Pregnancy: Placental Function

- Metabolites adversely affect placental function:
    - Nicotine affects cells in the placenta, causing cell death and damage
    - Nicotine, carbon monoxide, and cyanide have vasoconstrictive properties – reduces the flow of blood and nutrients to the placenta.
- Smoking is a risk factor for placental abruption, placenta previa, and preterm premature rupture of membranes (PPROM).
- Smoking is associated with a higher risk of preterm birth.

# Effect of Smoking on Pregnancy: Nutrients and Oxygen

- Tobacco smoke metabolites reduce uterine blood flow:
  - Vasoconstrictors (nicotine, carbon monoxide [CO], cyanide) constrict uterine blood vessels, reducing the blood and nutrient flow to the fetus.
  - Maternal smoking is a well-established cause of fetal growth restriction.
- CO reduces oxygen flow, which can result in fetal hypoxia and cell death.

# Effect of Smoking on Fetal Development: Toxicants

- Nicotine and other metabolites may cross the placenta and interfere with fetal development.
    - In utero exposure to tobacco leads to remodeling of the lungs which may result in respiratory problems.
    - Prenatal exposure to smoking affects the function of neurotransmitters involved in arousal and regulating breathing.
    - Exposed infants may be less likely to awake when oxygen levels drop, increasing the risk of SUDI.

# Effect of Exposure to Secondhand Smoke in Pregnancy and Childhood

- Second hand smoke (SHS) exposure carries the same risks associated with active smoking in the pregnancy.
    - The effects are lower in non-smoking women compared to smoking women due to reduced exposure.
- Postnatal exposure to SHS is associated with increased risks of asthma and respiratory infections, ear infections, and SUDI.
- SHS exposure is a risk factor for smoking initiation in adolescence.

*US Department of Health and Human Services 2006. Laverty et al. Thorax 2018; 74(6):607-610.*

# Effect of Alcohol on Fetal Development

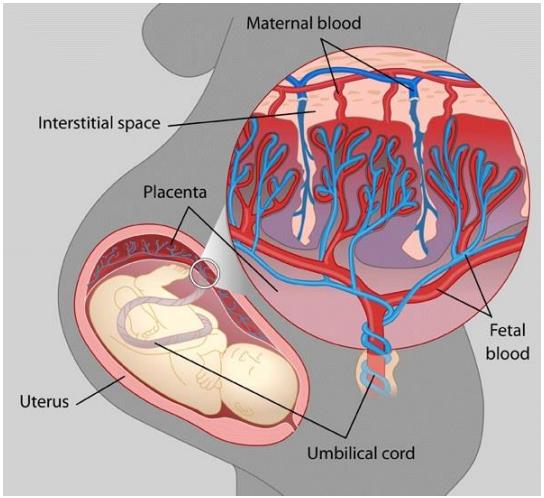



Image: Duke University https://sites.duke.edu/apep/module-5-alcohol-and-babies/

- Alcohol passes freely through the placenta directly to the fetus.
- The alcohol is delivered to the fetus at the same concentration as the mother's blood alcohol content.
- Because the fetus has fewer and less efficient enzymes, and reduced elimination, alcohol has a sustained and prolonged effect on the fetus.



*Gupta et al. Alcohol Clin Exp Res 2016;40(8):1594-602. Guerri, Pascual. Reproductive and Developmental Toxicology 2017.*

# Effect of Alcohol on Fetal Development

- Alcohol interferes with fetal development via direct cell damage or by interfering with cell development:
    - Metabolism of ethanol generates reactive chemical species (oxygen-derived free radicals, hydroxyethyl radical, acetaldehyde and other aldehydes).
    - These toxic substances cause neuronal damage and cell loss.
    - Brain and CNS are vulnerable to prenatal alcohol exposure, with multiple brain regions affected.

# Effect of Alcohol on Fetal Development

- Fetal death: 22% increased odds of miscarriage from five or more drinks per week. *Sundermann et al. Alcohol Clin Exp Res 2019; 13.*
- Delivery outcomes: Increased risk of preterm birth, low birth weight and small for gestational age associated with heavy alcohol use (average two or more drinks per day). *Patra et al. B J Obst Gyn 2011; 118(12):1411-21.*
- Development: Heavy alcohol use and binge drinking have been associated with increased risk of behaviour problems and deficits in executive function.

  *Khoury et al. Neuropsych Rev 2015; 25(2):149-70. Sayal et al. Eur Child Adoles 2014; 23(10):891-99.*

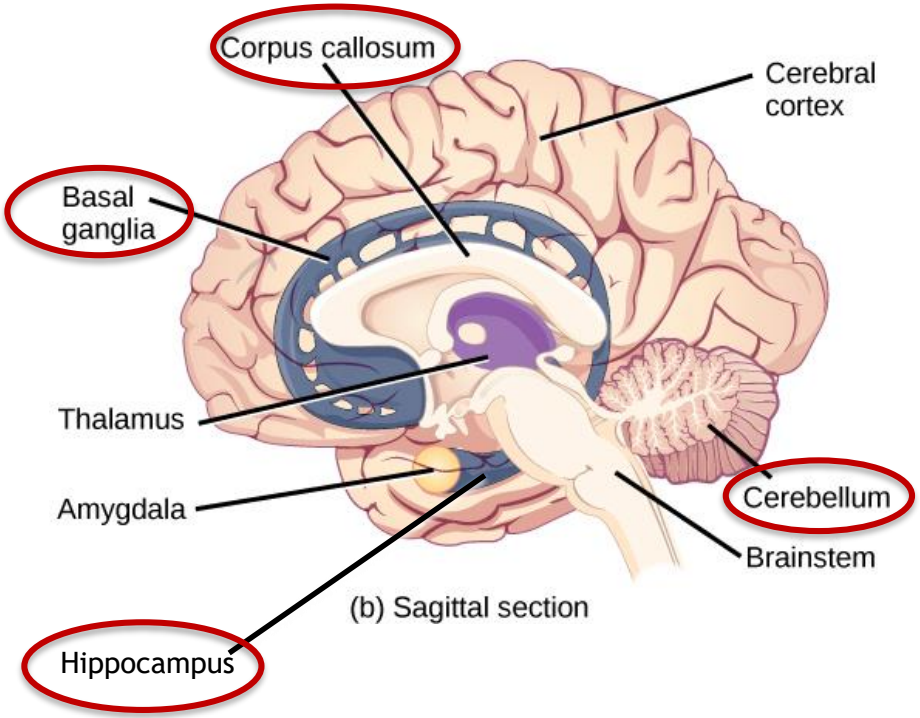
# Fetal Alcohol Spectrum Disorder

*"Fetal Alcohol Spectrum Disorder (FASD) is a diagnostic term used to describe impacts on the brain and body of individuals prenatally exposed to alcohol. FASD is a lifelong disability. Individuals with FASD will experience some degree of challenges in their daily living, and need support with motor skills, physical health, learning, memory, attention, communication, emotional regulation, and social skills to reach their full potential. Each individual with FASD is unique and has areas of both strengths and challenges."*

Harding et al. *Canada Fetal Alcohol Spectrum Disorder Research Network*, 2019.

# Effect of Alcohol on Fetal Development

- Brain development: Individuals with heavy prenatal alcohol exposure (FAS and FASD) show consistent structural differences in the brain.




du Plooy et al. *Arch Clin Neuropsych* 2016;31(7):710-26.

# Type of Alcohol Exposure: How much and when?

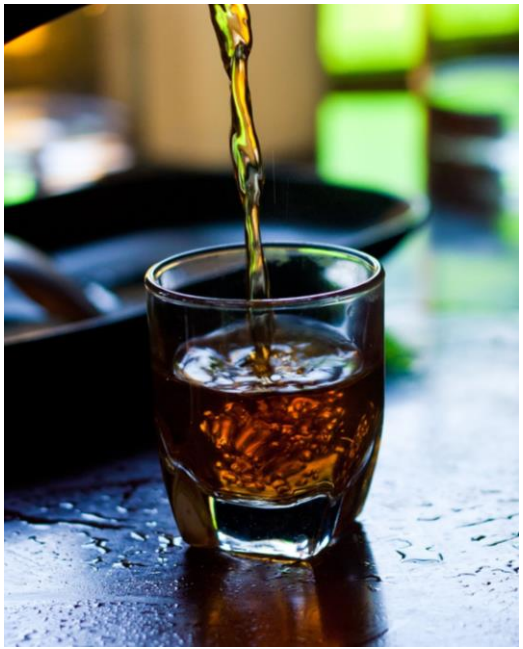
- Low to moderate alcohol use: There is no consistent association between consuming up to 7 standard drinks per week and adverse outcomes.
    - Findings of increased risk of preterm birth, growth restrictions, and problem behaviours, but the majority of studies found that the there was no consistent association between low to moderate alcohol use and harm.
    - However, in some studies have found that drinking at low levels has an apparent protective effect for some outcomes.

# Type of Alcohol Exposure: How much and when?

- Episodic binge drinking: There is growing evidence to suggest that episodic binge drinking (5 standard drinks per occasion) may adversely affect childhood outcomes.
    - Four out of five studies found a significant association between binge episodes and problem behaviours (increased risk of clinical or abnormal scores).
    - Binge drinking not associated with increased risk of adverse delivery outcomes (preterm, growth restriction etc.).

# Type of Alcohol Exposure: How much and when?

- Timing: Mixed findings for timing of alcohol exposure.
  - Studies have found increased risk of growth restriction associated with late pregnancy alcohol consumption, while others have shown an association for early pregnancy alcohol consumption. One study found a protective effect of late pregnancy alcohol use.
- Type: Few studies have evaluated the effect of different types of alcohol.
  - One study found that drinking spirits was associated with an increased risk of miscarriage.



# What can health professionals do to reduce exposure?

The Ministry of Health recommends the ABC approach to reduce alcohol and tobacco exposed pregnancies.

- A: **Ask** all women about their alcohol and tobacco use.
- B: Provide **brief advice** on why it is important not to use alcohol and tobacco during pregnancy and what the consequences are for alcohol and tobacco exposed pregnancies.
- C: Refer to **counselling** or **cessation support** as needed.

# What can health professionals do to reduce exposure?

- **Ask *all* women about their alcohol and tobacco use.**
    - There is no one group of women that is at risk for exposed pregnancies.
    - Studies suggest that most health professionals do not ask all women about alcohol use. Women want and expect to receive advice from health professionals about alcohol and tobacco use during pregnancy.

# What can health professionals do to reduce exposure?

- **Provide brief advice**
  - It is *safest* for women to be smokefree (and ideally nicotine free) and alcohol free during pregnancy.
  - Advice has been shown to have a stronger effect if linked to current health concerns (i.e. healthy pregnancy).
  - Pregnancy is an opportunity for health professionals to support women to make long term changes to improve their health during and after pregnancy.

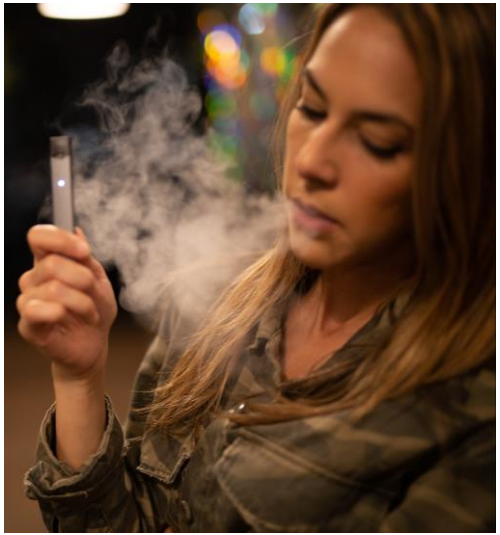
# What can health professionals do to reduce exposure?

- **Refer to counselling and/or encourage cessation support**
  - Offer referral pathways to counselling including self-referral and online resources for at risk individuals.
  - Examples:
    - Alcohol Drug Helpline
    - Quitline
    - Community Alcohol Drug Service
  - Interventions should involve partners and the wider support system in order to improve effectiveness.

# What can health professionals do to reduce exposure?

- **Nicotine Replacement Therapies (NRT)**
  - If complete cessation is not feasible nicotine replacement therapies (NRT) and nicotine e-cigarettes may be used to support cigarette abstinence.
  - Nicotine carries some risks to the fetus, but at reduced levels relative to cigarette smoking.
  - Pregnant women should be advised of the potential risks and benefits of using NRT, and it should only be offered in combination with behavioural support.

# What can health professionals do to reduce exposure?



- **Nicotine e-cigarettes/vaping**
  - Current evidence suggests e-cigarettes are a safer alternative to traditional cigarettes.
  - However, little research has been conducted on their safety for pregnant women.
  - Nicotine dose should be kept low and women should completely switch to e-cigarettes rather than using e-cigarettes to reduce their use of traditional cigarettes.

# What can health professionals do once exposure has occurred?

- Infants prenatally exposed to smoking or alcohol use are at increased risk for adverse health outcomes including SUDI, asthma, and FASD.
- Early detection of exposed pregnancies can facilitate diagnosis and support for families and exposed individuals.
- Actions: include any prenatal exposure in medical record, provide advice to parents re: safe sleeping positions/environment, developmental assessments later in life.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Thank you