FASD-CAN
Fetal Alcohol Spectrum Disorder
Care Action Network

FASD and Epigenetics:
What Pāpā, Fathers and Partners Need to Know

Welcoming a new pēpi (baby) is one of the most significant and exciting times in a person's life. This is a shared journey with partners, friends, family, and whānau. The support provided to the hapū māmā (pregnant person) is critical. Recent research has been exploring the epigenetic effects of the health of the biological sperm contributor on the development of the pēpi (baby). We now know that the physical health and mental wellbeing of the person contributing the sperm is very important in supporting healthy development. Research highlights the vital role of lifestyle choices - especially regarding alcohol - in pre-conception health, and the ongoing importance of a supportive, substance-free environment for all types of family structures, including those using donors or conceiving outside of a traditional partnership.

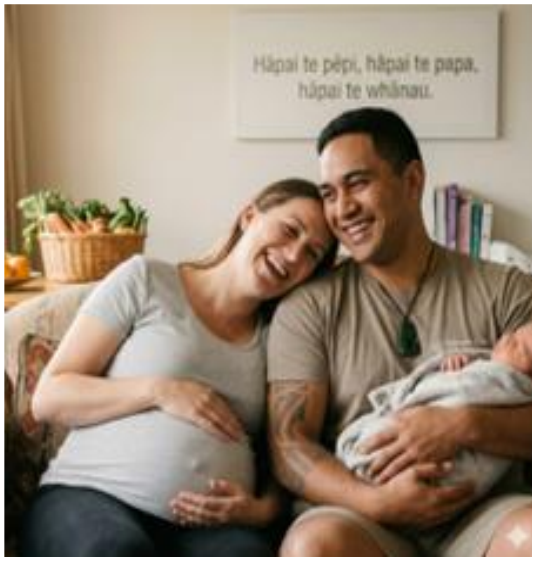

Image: AI generated

A 2026 *Lancet* paper also emphasises that preconception health for pāpā and partners is an **equity** issue: men's/partners' health is shaped across the life course (including stress, access to care, and wider social conditions), and supporting the biological sperm contributor before pregnancy helps improve outcomes for the pregnant person, pēpi, and the whole whānau.[1]

What is Fetal Alcohol Spectrum Disorder (FASD)?

Fetal Alcohol Spectrum Disorder (FASD) is a diagnostic term used to describe a range of permanent, brain and body-based conditions that can occur as a result of prenatal alcohol exposure (PAE).[2] In Aotearoa New Zealand, the diagnostic approach is outlined in the Whakakotahitanga (Unity) FASD Diagnostic Guidelines.[3]

FASD can occur when a developing fetus is exposed to alcohol in the womb (prenatal alcohol exposure). This is why health authorities in Aotearoa New Zealand (including Health New Zealand / Te Whatu Ora) and around the world, confirm there is **no safe amount, no safe type, and no safe time** to drink alcohol during pregnancy.[2]

Unplanned pregnancies are common in Aotearoa, which means a person may consume alcohol for some time before becoming aware they are hapū (pregnant). The 'Growing Up in New Zealand' (GUINZ) study found that up to 40% of pregnancies were unplanned.[4] Regardless of how a pēpi is conceived - whether planned with a partner or donor, or unplanned - the most helpful thing a partner or whānau member can do is to support the pregnant person to stop drinking immediately. For local information and whānau-focused support and advocacy, contact FASD-CAN Inc. Aotearoa.[5]

When alcohol is consumed during pregnancy, it travels through the placenta to the developing baby. Because a fetus cannot process alcohol like an adult, the alcohol remains in their system for much longer, which can disrupt the development of the brain and body.[2][6] If there is no alcohol exposure during any stage of the pregnancy, a person cannot develop an FASD disability.[2][6]

Supporting All Whānau: The Role of Sperm Health

While the responsibility for a healthy pregnancy is shared by all whānau, recent biological research has focused specifically on the health of the sperm and the biological sperm contributor. Although alcohol consumption by the sperm contributor is not the direct cause of FASD, new research shows that alcohol use by them, particularly in the months **before conception**, can impact a child's health and development. This is a growing area of study that highlights how both biological parents' well-being affects a baby's start in life. Importantly, researchers have been exploring paternal alcohol exposure effects for decades, with early work appearing well before the recent epigenetics boom.[7]

1. How sperm health affects fetal development (Epigenetics)

For anyone involved in the conception process, it is important to know that lifestyle choices can influence the quality of sperm cells. Beyond just carrying DNA, sperm act as messengers. To understand this, it helps to think of the difference between DNA and RNA:

- **DNA (deoxyribonucleic acid)** acts as the permanent master blueprint—the 'hard-wired' copy of the biological instructions required to build a human body.
- **RNA (ribonucleic acid)** is like the 'working copy' or software that carries out specific instructions, telling the body how to build and grow a baby.

Research from 2024–2026 shows that sperm are "loaded" with small RNA molecules (called tsRNAs and miRNAs) that carry environmental signals—such as stress, diet, or alcohol use—directly to the developing pēpi.[8] To understand how these lifestyle factors actually change the messages inside the sperm, we have to look at the body's internal response.

Because this science is very new, researchers are working to understand how these findings apply to people in everyday life. While there is strong evidence from animal models, human studies can vary because every person's life and environment are unique. This is why findings are interpreted carefully, focusing on achieving the best possible health outcomes for the whole whānau.[9]

Recent studies indicate that these changes to sperm are often driven by "oxidative stress". When the liver processes alcohol, it produces signals that can change the delicate biological environment within the reproductive system where sperm are created and matured, leading to these epigenetic shifts that affect a child's future development.[10][11] Specifically, when the liver is working to clear alcohol, the body experiences "oxidative stress" - a kind of internal imbalance. This imbalance sends signals to the reproductive system, which can change the "instructions" carried by the sperm. These instructions can then influence how the baby's brain and body develop long after the alcohol has left the biological contributor's system.[10][11]

Key Insight: Alcohol affects Sperm

When the liver processes alcohol, it triggers 'oxidative stress'—an internal imbalance that can effectively re-write the biological instructions carried by sperm, influencing a child's development long after the alcohol has left the system.

To understand how these altered instructions actually reach the pēpi, we have to look at the sophisticated biological delivery system that sperm use. After sperm are produced, they travel through a part of the reproductive system called the epididymis to mature. During this journey, they interact with tiny fluid-filled sacs called "epididymosomes" that act like biological delivery parcels. These parcels are loaded with specific RNA instructions based on the biological contributor's health and environment at that time. At the moment of conception, these instructions are delivered directly into the egg, providing the very first "software" that tells the baby's genes how to function and grow. This means the environment and wellbeing of the biological sperm contributor in the months before conception directly helps shape the starting instructions for the child's development.[8][11]

Alcohol can harm the quality of sperm cells. It can cause **"epigenetic changes"** - think of these like switches that turn certain genes "on" or "off". These altered switches can be passed on to the pēpi, potentially affecting how they grow. This means alcohol consumption by the biological sperm contributor can leave a **biological "mark"** on children before they are even conceived.[8][10][11]

2. Long-term effects of biological 'marks' on the pēpi

While a **biological 'mark'** is permanent, it doesn't mean a child's future is set in stone; rather, it identifies that they may face specific challenges as they grow. Because this 'programming' affects the body at such a deep level, long-term these epigenetic changes can influence:

- **Placental health:** Emerging research highlights that paternal health (including BMI and diet) directly impacts how the placenta grows and functions. A healthy placenta is essential for providing the pēpi with nutrients and oxygen throughout the pregnancy.[12]
- **Brain function and learning:** A child might find it harder to process complex information, focus in school, or manage "executive functions" like planning and organising.[10][13][14]
- **Emotional wellbeing:** There is an increased risk of challenges with anxiety, mood regulation, and how a child responds to stress. They might feel 'overwhelmed' more easily than their peers.[13]
- **Physical health:** Research suggests these marks can affect metabolism and the immune system, potentially leading to a higher sensitivity to certain health conditions later in life.[12][15][16]
- **Metabolic programming:** It can even influence how a child's body processes nutrients or reacts to substances (like alcohol) when they become an adult.[7][10][11][15] This can show up in several ways:
  - **Altered sensitivity:** Research suggests that paternal alcohol exposure can change the brain's "reward system". This may result in a person who is significantly more sensitive to alcohol's effects - meaning their coordination and thinking might be more easily impaired by smaller amounts.[7][10][11][15]
  - **Metabolic health:** These cellular changes can lead to "metabolic programming" issues, such as difficulties with how the body processes sugar or manages insulin, potentially increasing the risk of weight-related or metabolic challenges (like diabetes or obesity) in adulthood.[11][12]

- **Sex-specific effects:** New research highlights that these metabolic changes can be **sex-specific**, meaning they may affect the growth and energy management of male and female offspring in different ways.[11][12]

How this works: This particular study suggests that the epigenetic markers (DNA methylation) altered by alcohol in the sperm interact with the unique hormonal and chromosomal environment of the fetus. Because male and female pēpi have different hormonal backgrounds during development, the same 'biological mark' from the sperm can result in different physical or metabolic outcomes:

- ✓ **Male Offspring:** Research indicates a higher susceptibility to the "rewiring" of glucose and insulin systems, potentially leading to insulin resistance and increased body weight in adulthood.[11]
- ✓ **Female Offspring:** While epigenetic changes occur, females may exhibit different growth trajectories or variations in how the liver processes fats, often showing fewer insulin-related challenges than males.[11][12]

DNA Methylation: You can think of DNA methylation as a series of 'biological volume knobs' on our genes. While our DNA is the permanent master copy of our instructions, methylation is the process that decides how loudly or quietly each instruction is played. Alcohol use can turn these volume knobs up or down in the sperm, changing the intensity of certain growth or health messages that are delivered to the baby.[9][10][11]

Key Insight: A Lifelong Legacy

Because these changes happen at the cellular level during the very earliest stages of development, they influence the foundational 'programming' of how the brain and body function. This **biological 'mark'** is permanent and can affect a person well into adulthood -influencing everything from how they learn and manage stress to how their metabolism processes nutrients later in life.

The power of environment: While genetics and epigenetics provide the 'blueprint' for fetal development, the environment provides the 'building materials'. While the biological 'mark' might be permanent, the supportive environment a whānau provides acts as the essential support that helps a child navigate these challenges. A stable, loving, and supportive home environment can significantly improve health and life outcomes - such as better emotional regulation, improved learning success, and greater independence in adulthood - helping a child reach their full potential, regardless of these early risks.

3. Developmental and behavioural challenges kinked to sperm health

Since 2018, studies have linked alcohol consumption by the biological sperm contributor before conception to various challenges for tamariki (children):

- **Physical and thinking challenges:** higher chances of children experiencing slower growth and difficulties with learning, memory, thinking, and hand-eye coordination.[10][12][16]
- **Behavioural challenges:** A prospective cohort study found that when biological sperm contributors drank alcohol before conception, it was linked to a higher risk of their children experiencing behavioural challenges.[17] These challenges can present differently in children:

- **Feeling anxious or low:** Research indicates this is a common challenge for both boys and girls.[17]
- **Physical complaints:** Children, particularly girls, may experience physical discomfort with no clear medical cause, such as tummy aches.[17]
- **Trouble sleeping:** Difficulty with sleep patterns is more commonly noted in girls.[17]
- **Thinking and Emotional Regulation:** Children may experience difficulty with clear thinking, emotional regulation, or having unusual thoughts. These traits are frequently observed in girls.[9][10][13][17]
- **Acting out:** Challenges with following rules or acting out are more common in boys.[17]

- **Amount of alcohol:** Research is looking at "dose-dependent" effects, meaning the impact can be greater if more alcohol is consumed. One study defined a sperm contributor as being "exposed to alcohol" if they drank alcohol at least once a week during the three months before conception.[18]
- **Alcohol sensitivity (and how it works):** Some studies suggest that if a biological contributor is exposed to alcohol before conception, it can change the "set point" of a child's reward system. This means their brain may be more reactive to alcohol, making them feel the physical and mental effects (like loss of coordination) much sooner and more intensely than others.[15] This biological shift can also increase the likelihood of developing an addiction later in life, as the brain's reward system may "crave" the substance more strongly or experience a more powerful reaction to it.[7][10][11][15]
- **Serious health risk:** Recent findings suggest a link between a biological contributor having an alcohol use disorder before conception and a higher risk of their children dying.[10][16][19]
  - **Effects across generations:** The idea that these epigenetic changes can be passed down is a growing area of scientific study. This means a person's past alcohol use might not only influence their direct children but could potentially affect their grandchildren and future generations through those genetic "switches".[9][11]
  - **Brain growth factors:** This transgenerational link may be caused by changes in "neurotrophic factors" - essential proteins like BDNF (Brain-Derived Neurotrophic Factor) that act like "brain food" to help neurons grow, survive, and form the necessary connections for learning and memory. Alcohol consumption by the biological sperm contributor can lower these levels, which may affect how the brain builds its architecture across generations.[9][11]

4. Impact of sperm health on FASD outcomes

While alcohol use by the biological sperm contributor does not cause FASD, it is now considered a **significant "co-factor"** that can influence the severity of the condition and help explain the variability in FASD outcomes. A 2025 large-scale human study[14] found that when the biological sperm contributor consumed alcohol, particularly heavy (high volume) or frequent (regular occurrences) use prior to conception, children with FASD could exhibit more pronounced traits, such as:

- **Smaller head circumference:** A biological marker indicating impact on early brain growth.

- **More pronounced facial features:** A clearer presence of the physical traits associated with the disability. Animal-model dose–response research also suggests that preconception paternal alcohol exposure may contribute to alcohol-related craniofacial differences, potentially complicating diagnosis and severity patterns.[18]
- **Neurocognitive impact:** Increased challenges with IQ, memory, and learning and thinking potential.[14]

These findings from the 2025 study[14] and a 2023 systematic review[20] highlight that the choices made by the biological sperm contributor help determine the overall biological impact on the pēpi, reinforcing the fact that the foundations of a pēpi's health are a **shared biological responsibility**. Understanding this highlights that the journey to a healthy start is a collective biological effort, where the preconception health of the biological sperm contributor plays a vital role in nurturing the potential of our tamariki.

Key Insight: A Shared Biological Journey

The biological foundations for a pēpi's health are established by both genetic contributors at the moment of conception. While FASD is caused by prenatal alcohol exposure, the health of the sperm acts as a significant "co-factor" in a child's development.

5. Proactive health for pāpā and partners: Building a healthy foundation

Research doesn't just identify risks; it also highlights **protective factors** that the biological sperm contributor can adopt to actively support the pēpi's potential. These proactive steps can help mitigate oxidative stress and support healthy DNA repair:

The large 2023 systematic review of paternal preconception *modifiable risk factors* (including alcohol, smoking, cannabis use, BMI, nutrition, stress, and physical activity) found associations with a range of pregnancy and offspring outcomes, supporting the value of practical preconception health actions for fathers and partners.[20]

General preconception guidance also highlights the value of nutrition, healthy weight, sleep, and avoiding harmful exposures to support fertility and healthy conception.[21][22][27]

- **Nutrition as DNA support:** Adequate intake of folate (Vitamin B9), Zinc, and Vitamin C is essential. These nutrients act as 'repair kits' for sperm DNA, helping to prevent the epigenetic switches from flipping in a negative direction.[21][22]
- **Exercise and metabolic health:** Moderate physical activity helps regulate the "metabolic instructions" carried in sperm, which can provide the baby with a stronger starting point for their own lifelong physical health.[7][22]
- **Stress Resilience:** High levels of chronic psychological stress produce cortisol, which can directly trigger oxidative stress – the cellular imbalance that can damage DNA and alter the RNA 'instruction parcels' (tsRNAs) in sperm. Practices that reduce stress—such as *mihi*, *karakia*, or mindfulness—help lower cortisol levels and lessen this biological imbalance, helping the instructions delivered to the egg to be as healthy as possible.[8][10][11][15][20][22]

Use of Tobacco, Cannabis, and Other Drugs

Evidence shows that alcohol is not the only substance that can affect reproductive health. The use of tobacco, cannabis, and other recreational drugs by the person providing the sperm can also impact the developing pēpi.[17][23]

A 2024 clinical review in *Nature Reviews Urology* summarizes evidence that paternal substance use (including alcohol, tobacco/nicotine, cannabis, and opioids) can affect male reproductive health and is associated with adverse offspring outcomes, with epigenetic mechanisms highlighted as a plausible pathway in preclinical models.[24]

- **Tobacco and vaping (Pre-conception):** Smoking and vaping expose sperm to toxins that cause DNA damage and epigenetic changes. This can increase the risk of low birth weight and birth defects, even if the person stops smoking before the pregnancy begins.[23][24]
- **During pregnancy (Environmental risk):** If anyone smokes or vapes around a pregnant person, the 'second-hand' exposure contains nicotine and harmful chemicals. These toxins enter the pregnant person's bloodstream and cross the placenta. This exposure is a known risk factor for preterm birth, low birth weight, and Sudden Infant Death Syndrome (SIDS).[23]
- **Cannabis:** Like alcohol, cannabis can affect sperm health and epigenetic markers, potentially altering genes related to brain development.[9][10][24]
- **Other Recreational and Prescription Drugs:**
    - **Cocaine and opioids:** Studies suggest that these substances can alter the genetic information in sperm, which may be linked to developmental delays or behavioural challenges in offspring.[23][24]
    - **Methamphetamine:** Research indicates that methamphetamine use can lead to significant oxidative stress, potentially damaging sperm DNA and increasing the risk of congenital anomalies.[23][24]
    - **Anabolic steroids:** These can severely reduce sperm count and quality, making conception more difficult and potentially affecting the health of the pēpi.[23][24]
    - **Prescription medications:** Large-scale studies have shown that when biological contributors are exposed to certain prescription medications shortly before conception, there is an increased risk of adverse outcomes, such as preterm birth or low birth weight.[25]
    - **Chronic health & specialised medications (DMARDs and Biologics):** Very recent research from 2025 has specifically examined Disease-Modifying Anti-Rheumatic Drugs (DMARDs) and biologics - often used for conditions like Rheumatoid Arthritis, Lupus, or Crohn's Disease.[26]
    - **General medications (antidepressants, blood pressure, etc.):** A major 2024 analysis of global safety data identified that a wide range of common medications—including certain antidepressants and blood pressure treatments—showed associations with pregnancy and birth outcomes when taken by the biological contributor prior to conception.[25]

Building a strong foundation through proactive care

For anyone planning to contribute sperm for fetal development, and for whānau managing chronic health conditions, the 2025 research by Shao and colleagues[26] provides a high level of reassurance. Their findings indicate that many biologic treatments have a lower risk profile for sperm health than previously believed.[26] While research is ongoing and not yet definitive, the most important step is a supportive conversation with your specialist. Discussing your full range of medications - including those for mental health or heart health - ensures you are making informed decisions for your future baby.[25] Staying medically stable is itself a vital part of creating a healthy environment for your pēpi.

The Power of Partner and Whānau Support

For all partners and whānau, regardless of gender or biological connection, your choices during the pregnancy are one of the strongest predictors of the baby's health.

- **Social Modelling:** If a partner stops drinking during the pregnancy, it becomes much easier for the pregnant person to remain alcohol-free. It removes the 'social isolation' of not drinking.
- **Environmental Safety:** Promoting a home environment free from smoke and vapour is a crucial step for both pre-conception health and a safe home during and after pregnancy.

The Importance of Planning: Creating Healthy Sperm and Strong Families

The journey to conception is shared. Sperm takes about three months to fully develop, which is why lifestyle choices in the months *before* conception are so important.[21][27]

1. **What makes sperm healthy?**

   Healthy sperm is generally defined by three factors:[21][22][27]

   1. **Quantity (sperm count):** The number of sperm present.
   2. **Movement (motility):** The ability of the sperm to swim effectively toward the egg.
   3. **Shape (morphology):** Having the typical structure needed for travel and fertilisation.

2. **The three-month window**

   Health experts recommend starting these changes at least **three months prior to conception**. This is because it takes about 90 days for new sperm to be produced and mature.[21][27]

   - **Spermatogenesis (Production):** The actual creation of new sperm cells takes approximately **74 days**.[27]
   - **Maturation and Travel:** After they are produced, sperm then spend about **10 to 14 days** maturing and travelling through the reproductive system.[27]
   - **Total Cycle:** When you combine these stages, it takes roughly **90 days** (about three months) for a sperm cell to be fully ready for conception.[21][27]

3. **Other Lifestyle Factors**

   - **Age of the biological sperm contributor:** Research identifies that "advanced paternal age" (typically defined as men over 40) is linked to higher incidences of congenital abnormalities and neurodevelopmental challenges like autism and schizophrenia. This is partly due to natural genetic mutations and epigenetic shifts over time.[1][13][20][22]

- **Nutrition and Weight:** Obesity in the biological sperm contributor and high-fat diets can change the microRNA in sperm. These changes act as 'metabolic instructions' that may increase the risk of obesity, diabetes, and other metabolic challenges for the pēpi later in life.[11][12][20][21][22]
- **Heat exposure:** The testes work best when kept slightly cooler than the rest of the body. Frequent use of hot tubs, saunas, or keeping a laptop directly on the lap for long periods can temporarily reduce sperm quality.[21][22][27]
- **Stress and sleep:** Chronic stress can affect the hormones needed for healthy sperm. Prioritising 7–8 hours of sleep and using stress-management techniques is beneficial for reproductive health.[20][21][22]

Advice for Partners: Shared Health and Positive Steps

Understanding this research is a powerful step towards giving tamariki (children) the best possible start.

- **Before conception (Planning):** To support the best outcomes, it is recommended that people planning to conceive avoid alcohol for at least three to six months beforehand. This timeframe is vital because it takes roughly 90 days for new sperm to mature. Stopping alcohol well in advance ensures that the sperm used for conception have developed in a healthy, toxin-free environment.[10][18][20][21][27]
- **Other substances:** Tobacco, vaping, and cannabis can damage sperm and create 'environmental risks' during pregnancy. Seeking support to stop is a crucial step for both pre-conception health and a safe home environment.
- **During pregnancy (Support):** A partner's support is incredibly helpful in ensuring an alcohol-free environment. When partners also avoid alcohol, they model the importance of an alcohol-free pregnancy and make it easier to manage social pressure to drink. This shared commitment strengthens the partnership and keeps the focus on the baby's health.

Key Insight: The 90-Day Opportunity—A Proactive Reset

Unlike the genetic code itself, which is set, the biological 'instructions' carried by sperm are constantly being updated as new sperm are produced. Because a full sperm cycle takes roughly 90 days, every three months represents a new opportunity for a biological 'reset'. This means that lifestyle choices made today—like stopping alcohol use—can significantly improve the health instructions delivered to a future pēpi in just a few months.

Understanding Risk and Individual Outcomes

It's natural to think, "My father drank all the time, and I turned out okay!" This may be a true and a valid reflection of your individual experience, but it also highlights the vast complexity and resilience of human genetics.

However, the key word here is **risk**.

When new research links alcohol use by a biological contributor to subtle epigenetic changes in sperm, it doesn't guarantee a negative outcome for every child. Instead, it identifies an **increased probability**—an added risk factor—for certain developmental and behavioural challenges.

- **You are not your father:** The research reviewed and included here is very recent (2018–2025) and provides us with knowledge that was simply unavailable to previous generations. We now understand the three-month window for sperm health better than ever before.
- **Optimal vs. Fine:** While you may feel fine, the new science focuses on achieving the *optimal* outcome for your child's physical and neurological development, rather than simply avoiding adverse outcomes.
- **An investment in health:** Choosing an alcohol-free three-month period isn't a judgment on the past; it's an investment in your child's future health based on the most current science. This choice is about using the best available information to give your baby the healthiest possible start in life.[10][[20][21]
- **The broader context of fertility:** It is worth noting that in many countries with high alcohol consumption rates, birth rates are dropping, and infertility is on the rise. Research increasingly connects lifestyle choices—including alcohol and drug use—to reproductive challenges in both men and women. Avoiding these substances not only lowers the risks for the baby after conception but also maximises your chances of conceiving successfully in the first place.[20][21][22][24]

When Stopping Drinking or Using Recreational Drugs is Hard: Reach out for Support

It is an act of real strength to seek help when you are finding it difficult to stop drinking. If you are struggling to maintain an alcohol-free period for yourself and to support your pregnant partner and developing baby, please know that confidential help is available.

1 **Talk to a Healthcare Professional First:** Contact your GP (General Practitioner) or a registered counsellor. They can:
    - **Assess your needs** confidentially.
    - **Create a safe and practical plan** to stop drinking.
    - **Connect you immediately** with local, free alcohol and drug counselling services.
2. **Contact a Dedicated, Free and Confidential Support Service (Aotearoa/NZ):**
    - **Alcohol & Drug Helpline: Call 0800 787 797.** This service is available 24 hours a day, 7 days a week, and is completely free and confidential. They can connect you with local support.
    - **Need to Talk? (Mental Health Helpline):** Text or call 1737. This free service is available 24/7 and is great for immediate emotional support, which often underpins addiction challenges.
    - **The Salvation Army:** Provides specific, non-judgmental Alcohol & Drug Support services across Aotearoa New Zealand. You can call their local centres for information on available programmes.
3. **Use the "Buddy" System:** Find a trusted person (a family member, friend, or support person) who you can call instantly when you feel the urge to drink. This accountability is a powerful tool.

Conclusion

Giving a baby the best start in life is a team effort. While FASD is caused by prenatal exposure to alcohol, the health of the person providing the sperm before conception and the partner's ongoing support during pregnancy are essential for a healthy start. When partners take proactive steps - like adopting a substance-free period before conception and during pregnancy - they provide crucial support and make a direct investment in their child's long-term well-being.

Note on Evolving Research: The findings in this resource reflect the evidence base and best practice at the time of publication (2026). Scientific understanding of epigenetics and male health is rapidly evolving; whānau and healthcare providers are encouraged to stay informed as new data emerges.

References and Resources

1. Huang, J., Schoenaker, D. A. J. M., & Godfrey, K. M. (2026). More equitable preconception health: Paternal life course opportunities for better pregnancy, child, and family outcomes. *The Lancet*. https://doi.org/10.1016/S0140-6736(26)00148-0
2. Health New Zealand | Te Whatu Ora. (n.d.). *Fetal alcohol spectrum disorder (FASD)*. https://www.health.govt.nz/your-health/conditions-and-treatments/disabilities/fetal-alcohol-spectrum-disorder-fasd
3. Crawford, A., Goldsbury, S., Henderson, T., van Wyk, J., Ware, F., Harmer, H., Te Whata-Maynard, K., Ngawati, M., Mutch, R., Davis, T. A., Dymus, J., & Reid, N. E. (2024). *Whakakotahitanga/Unity: The fetal alcohol spectrum disorder (FASD) diagnostic guidelines for Aotearoa (New Zealand) 2024*. Hāpai Te Hauora. https://www.tewhatuora.govt.nz/assets/For-health-professionals/Clinical-guidance/Diseases-and-conditions/Fetal-alcohol-spectrum-disorder/Fetal-Alcohol-Spectrum-Disorder-FASD-Diagnostic-Guidelines-for-Aotearoa.pdf
4. Morton, S. M. B., Perese, L. M., Atatoa Carr, P. E., Peterson, E., Bandara, D. K., Pryor, J. E., Grant, C. C., Ivory, V. C., Kingi, T. K. R., Reese, E., Robinson, E. M., Schmidt, J. M., Liang, R., & Waldie, K. E. (2010). *Growing Up in New Zealand: A longitudinal study of New Zealand children and their families. Report 1: Before we are born*. Growing Up in New Zealand. https://growingup.co.nz/growing-up-reports
5. FASD-CAN NZ. (2026). *About FASD in Aotearoa*. https://www.fasd-can.org.nz/about-fasd
6. Centers for Disease Control and Prevention. (n.d.). *About fetal alcohol spectrum disorders (FASDs)*. https://www.cdc.gov/fasd/about/index.html
7. Cicero, T. J. (1994). Effects of paternal exposure to alcohol on offspring development. *Alcohol Health & Research World, 18*(1), 37–41. https://pmc.ncbi.nlm.nih.gov/articles/PMC6876470/
8. Lismer, A., & Kimmins, S. (2023). Emerging evidence that the mammalian sperm epigenome serves as a template for embryo development. *Nature Communications, 14*, 2142. https://doi.org/10.1038/s41467-023-37820-2
9. Sum, K. K., Burton, M. A., García-Mauriño Alcázar, C., Teh, A. L., Godfrey, K. M., & Huang, J. Y. (2025). Strength of evidence for paternal influence on offspring epigenome in observational human studies: A systematic review and risk-of-bias appraisal for non-randomized exposures. *Epigenetics, 20*(1), 2594322. https://doi.org/10.1080/15592294.2025.2594322
10. Popova, S., Lange, S., Probst, C., & Rehm, J. (2019). Genetic and epigenetic perspectives on the role of fathers in fetal alcohol spectrum disorder. *Journal of Applied Genetics, 60*(3–4), 247–258. https://doi.org/10.1007/s13353-019-00511-6
11. Wang, Y., Li, J., Li, Y., Wang, Y., & Zhang, H. (2022). Transgenerational abnormalities induced by paternal preconceptual alcohol drinking: Findings from humans and animal models. *International Journal of Molecular Sciences, 23*(24), 15681. https://doi.org/10.3390/ijms232415681
12. Jazwiec, P. A., Patterson, V. S., Ribeiro, T. A., Yeo, E., Kennedy, K. M., Mathias, P. C. F., Petrik, J. J., & Sloboda, D. M. (2022). Paternal obesity induces placental hypoxia and sex-specific impairments in placental vascularization and offspring metabolism. *Biology of Reproduction, 107*(2), 574–589. https://doi.org/10.1093/biolre/ioac066

13. Golding, J. (2022). Paternal alcohol consumption and offspring mental health outcomes: A scoping review. *Psychological Medicine*. https://doi.org/10.1017/S003329172200155X
14. May, P. A., Hasken, J. M., Blankenship, J., Marais, A.-S., Gossage, J. P., Kalberg, W. O., De Vries, M., Robinson, L. K., Buckley, D., Manning, M., Parry, C. D. H., Hoyme, H. E., Tabachnick, B., & Seedat, S. (2025). Does paternal alcohol consumption affect the severity of traits of fetal alcohol spectrum disorders? *Alcohol: Clinical and Experimental Research, 49*(8), 1716–1729. https://doi.org/10.1111/acer.70105
15. Finegersh, A., & Homanics, G. E. (2014). Paternal alcohol exposure reduces alcohol drinking and increases behavioral sensitivity to alcohol selectively in male offspring. *PLOS ONE, 9*(6), e99078. https://doi.org/10.1371/journal.pone.0099078
16. Day, J., Savani, S., Krempley, B. D., Nguyen, M., & Kitlinska, J. B. (2016). Influence of paternal preconception exposures on their offspring: Through epigenetics to phenotype. *American Journal of Stem Cells, 5*(1), 11–18. https://pmc.ncbi.nlm.nih.gov/articles/PMC4913293/
17. Luan, M., Zhang, X., Fang, G., Liang, H., Yang, F., Song, X., Chen, Y., Yuan, W., & Miao, M. (2022). Preconceptional paternal alcohol consumption and the risk of child behavioural problems: A prospective cohort study. *Scientific Reports, 12*, 1508. https://doi.org/10.1038/s41598-022-05611-2
18. Higgins, S. L., Bhadsavle, S. S., Gaytan, M. N., Thomas, K. N., & Golding, M. C. (2024). Chronic paternal alcohol exposures induce dose-dependent changes in offspring craniofacial shape and symmetry. *Frontiers in Cell and Developmental Biology, 12*, 1415653. https://doi.org/10.3389/fcell.2024.1415653
19. Wang, Y., Li, J., & Zhang, H. (2024). Paternal preconceptional alcohol use disorder with the offspring's mortality risk. *American Journal of Preventive Medicine*. https://doi.org/10.1016/j.amepre.2024.02.017
20. Carter, T., Schoenaker, D., Adams, J., & Steel, A. (2023). Paternal preconception modifiable risk factors for adverse pregnancy and offspring outcomes: A review of contemporary evidence from observational studies. *BMC Public Health, 23*, 509. https://doi.org/10.1186/s12889-023-15335-1
21. Mayo Clinic. (2025). *Healthy sperm: Improving your fertility*. https://www.mayoclinic.org/healthy-lifestyle/getting-pregnant/in-depth/fertility/art-20047584
22. Public Health England. (2018). *The role of paternal health before conception: A review*. https://www.gov.uk/government/publications/paternal-health-preconception-report
23. American College of Obstetricians and Gynecologists. (n.d.). *Tobacco, alcohol, and drugs during pregnancy*. https://www.acog.org/womens-health/faqs/tobacco-alcohol-drugs-and-pregnancy
24. Lo, J. O., Hedges, J. C., Chou, W. H., Tager, K. R., Bachli, I. D., Hagen, O. L., Murphy, S. K., Hanna, C. B., & Easley, C. A., IV. (2024). Influence of substance use on male reproductive health and offspring outcomes. *Nature Reviews Urology, 21*(9), 534–564. https://doi.org/10.1038/s41585-024-00868-w
25. Zeng, Y., Lin, W., & Zhuang, W. (2024). Safety concerns of paternal drug exposure on fertility, pregnancy and offspring: An analysis based on the FDA adverse event reporting system. *Andrology*. https://doi.org/10.1111/andr.13790
26. Shao, Y.-H. J., Kuo, T.-T., Wang, W.-H., Chen, I.-C., Kao, C.-M., Chen, Y.-J., & Chen, Y.-M. (2025). Effects of paternal preconception exposure to conventional and biologic DMARDs on newborn outcomes. *Arthritis Research & Therapy, 27*, 223. https://doi.org/10.1186/s13075-025-03641-5
27. Cleveland Clinic. (2024). *Spermatogenesis: How sperm is produced*. https://my.clevelandclinic.org/health/articles/spermatogenesis

Additional reading (related research)

The following source is useful background reading but is not directly cited in the text above.

- Thomas, K. N., Srikanth, N., Bhadsavle, S. S., Thomas, K. R., Zimmel, K. N., Basel, A., Roach, A. N., Mehta, N. A., Bedi, Y. S., & Golding, M. C. (2023). Preconception paternal ethanol exposures induce alcohol-related craniofacial growth deficiencies in fetal offspring. *Journal of Clinical Investigation, 133*(11), e167624. https://doi.org/10.1172/JCI167624