

Alcohol and the **developing brain**

Parts of the brain are still developing during adolescence and undergoing many important changes. We now know that alcohol consumption during the teenage years can have a detrimental effect on the adolescent brain. This can affect motivation, decision-making, impulse control and other brain functions. Heavy drinking during adolescence may also affect brain functioning during adulthood.

As a result, experts agree that teenagers under 16 years of age should avoid alcohol.

Parents should consider the following key messages in relation to alcohol and the adolescent brain:

- **alcohol and the developing brain do not go together**

- although subtle in many cases, **the impact of alcohol on the developing brain can be permanent** and lead to young people not reaching their full potential
- **try to delay your child's first drink of alcohol for as long as possible.** If a young person is going to drink during this period, they should not drink much and they should certainly not drink regularly
- **research evidence is unclear about the potential benefits and risks of parents allowing children to have small amounts of alcohol.** If parents do allow this, careful thought should be given as to what age this practice should start and how often it is provided, with the new research on alcohol and the developing brain being considered

Adolescence and the developing brain

Adolescence is a difficult time for both parents and teenagers. Where we once believed that it was simply raging hormones and puberty causing the problems at this time, we now know that brain development during the teen years also plays a key role. Instead of the brain finishing developing around 15 years of age, as we once thought, studies have found that it continues to undergo many important changes during late adolescence right up until the early to mid-20s.

Parts of the brain are underdeveloped during this time, particularly the prefrontal cortex (the section that affects judgement, decision-making, planning and impulse control) and when teens make decisions they tend to use an alternative section - the amygdala (the emotional part of their brain). This results in a decrease in reasoned thinking and an increase in impulsiveness. Even when teens are aware of the potential risks of activities, they are ruled by their emotions, put simply: 'If it feels good, they'll do it!'

Adolescence is often associated with increased risk-taking behaviour. In recent times, we have come to understand what is actually happening here and

why it occurs. Young people don't take part in risky behaviour because they want to hurt themselves and it's not that they don't understand the dangers - it's just that they weigh 'risk versus reward' differently than adults. At their stage of development, the potential reward is likely to outweigh the possible risks. This has been found to be particularly true when adolescents are around their peers, i.e., if their friends are around, the reward is greater.

This 'risky behaviour' contradicts the basic human behaviour of survival. So why do teens behave in this way? Well, it's an evolutionary feature – young people are 'wired' to engage in risky behaviour during this period of their life so that 'when they leave the village' they are prepared for the dangers that lie ahead!

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The effects of drugs, including alcohol, are caused by how they affect different parts of the brain.

Alcohol affects the cerebellum, causing changes to balance and movement, and the frontal lobe, leading to speech becoming slurred. During adolescence, these changes are potentially more harmful because the brain has not yet fully developed.

The two parts of the brain that are particularly vulnerable to the effects of alcohol during

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adolescence are the prefrontal cortex and the hippocampus, both playing important roles in learning and memory. Development is still taking place in these sections and comprises of three key stages:

- **proliferation of pathways** – often referred to as the ‘growth spurts’ stage - where the brain is creating new neurons and synapses. This helps to ensure the brain is able to adapt to different environments
- **pruning of these pathways** – the brain does not need to keep all that has been produced and so, with experience, the unused pathways are eliminated. This is often referred to as the ‘use it or lose it’ stage
- **myelination** – a process where a fatty layer, called myelin, accumulates around neurons, enabling them to transmit information faster and more effectively

Research has shown that drinking alcohol during adolescence can adversely affect this development. Firstly, it inhibits the growth of neurons and, secondly, it decreases the process of myelination (vital during adolescence as it enables teens to plan, reason and make decisions more effectively).

In addition, studies have found that adolescent drinking may cause severe changes in the formation of adult personality, as well causing up to a 10 per cent reduction in the size of the hippocampus, thereby reducing memory and learning capacity. It is now believed that young people who drink regularly, and who are affected in this way, may never be able to catch up in adulthood.

Studies also suggest that heavy drinking during adolescence may produce permanent brain changes. ‘Plasticity’ is the term used to describe the brain’s ability to physically change its internal structure when learning new things. During peaks of plasticity, the brain must make key neural connections to wire us to become fully functioning adults. It is now believed that drinking alcohol during peak periods of plasticity may damage this ‘brain wiring’.

What does this mean for parents and their children?

It is important to clarify what we mean by ‘affect their brain development’.

Certainly, heavy, regular drinking during adolescence could cause permanent brain damage. In extreme cases, this could be serious enough to cause learning difficulties; to have problems with verbal skills; and lead to depression and alcohol dependence. For most young people, however, the ‘damage’ is likely to be far more subtle. Regardless, it is now believed that at the very least, drinking during the teenage years could lead to a young person being unable to achieve their full potential.

Therefore, the message is clear: alcohol and the developing brain do not go together and it is important to delay the initiation of alcohol for as long as possible.

Unfortunately, some Australian parents have difficulty accepting this information. Many drank alcohol during their adolescence and believe that it has not caused them problems in their adult life. Most are fully-functioning adults; they have positive relationships with family and friends and they have a job. Drinking alcohol as a teenager, seemingly, did not affect their brain development. As a result, some choose to provide alcohol to their teens.

Others prefer to supply alcohol to their teens in the home, believing that the practice may ‘protect’ their child in some way, i.e., if their child gets it from them, this will reduce the likelihood of them obtaining it from others and potentially drinking in a more dangerous way.

Parents need to make their own decisions around their children and the provision of alcohol. It is important, however, that whatever decision is made, it is based on good quality information and that new research on alcohol and its impact on the developing brain is considered.

What about the ‘Mediterranean Model’?

As already discussed, some parents believe that it is important that they introduce alcohol to their child in the home, preferably with a meal, to promote responsible drinking. This is commonly referred to as the ‘Mediterranean Model’, due to the prevalence of this practice within certain cultural groups.

The evidence is mixed on this practice and the recommendations from research varies considerably and is quite contradictory. On the one hand, there is research to suggest that parents can have a positive influence on their child’s

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drinking behaviour by allowing them small amounts of alcohol and trusting their child's ability to act responsibly and drink in moderation. That said, it is important to bear in mind that if parents do not set boundaries around drinking, their child is likely to drink more. On the other hand, recent studies suggest that introducing your child to alcohol at an early age, even in a family context, can lead to problem drinking in the future.