MedicalXpress

Study explains why some teenagers more prone to binge drinking

December 3 2012

New research helps explain why some teenagers are more prone to drinking alcohol than others. The study, led by King's College London's Institute of Psychiatry (IoP) and published in *Proceedings of the National Academy of Sciences* (*PNAS*) provides the most detailed understanding yet of the brain processes involved in teenage alcohol abuse.

Alcohol and other addictive drugs activate the dopamine system in the brain which is responsible for feelings of pleasure and reward. Recent studies from King's IoP found that the RASGRF2 gene is a risk gene for alcohol abuse, however, the exact mechanism involved in this process has, until now, remained unknown.

Professor Gunter Schumann, from King's IoP and lead author of the study says: "People seek out situations which fulfill their sense of reward and make them happy, so if your brain is wired to find alcohol rewarding, you will seek it out. We now understand the chain of action: how our genes shape this function in our brains and how that, in turn, leads to human behaviour. We found that the RASGRF-2 gene plays a crucial role in controlling how alcohol stimulates the brain to release dopamine, and hence trigger the feeling of reward. So, if people have a genetic variation of the RASGRF-2 gene, alcohol gives them a stronger sense of reward, making them more likely to be heavy drinkers."

Approximately 6 out of 10 young people aged 11-15 in England report drinking, a figure which has remained relatively stable over the past 20 years. However, binge drinking has become more common, with

teenagers reportedly drinking an average of 6 units per week in 1994 and 13 units per week in 2007. In the UK, around 5,000 teenagers are admitted to hospital every year for alcohol-related reasons. Teenage alcohol abuse is also linked to poor brain development, health problems in later life, risk taking behaviour (drunk driving, unsafe sex) and antisocial behaviour.

The study initially looked at mouse models without the RASGRF2 gene to see how they reacted to alcohol. They found that the absence of the RASGRF-2 gene was linked to a significant reduction in alcohol-seeking activity. Upon intake of alcohol, the absence of the RASGRF-2 impaired the activity of dopamine-releasing neurons in a region of the brain called the ventral tegmental area (VTA) and prevented the brain from releasing dopamine, and hence any sense of reward.

The research team then analysed the brain scans of 663 14 year old boys – who at that age had not been exposed to significant amounts of alcohol. They found that individuals with genetic variations to the RASGRF2 gene had higher activation of the ventral striatum area of the brain (closely linked to the VTA and involved in dopamine release) when anticipating reward in a cognitive task. This suggests that individuals with a genetic variation on the RASGRF-2 gene release more dopamine when anticipating a reward, and hence derive more pleasure from the experience.

To confirm these findings, the researchers analysed drinking behaviour from the same group of boys at 16 years old, when many had already begun drinking frequently. They found that individuals with the variation on the RASGRF-2 gene drank more frequently at the age of 16 than those with no variation on the gene.

Professor Schumann concludes: "Identifying risk factors for early alcohol abuse is important in designing prevention and treatment

interventions for alcohol addiction."

More information: Stacey, D. et al. 'RASGRF-2 regulates alcohol-induced reinforcement by influencing mesolimbic dopamine neurone activity and dopamine release' Proceedings of the National Academy of Sciences (*PNAS*) 2012

Provided by King's College London