Binge drinking can dramatically amplify damage to the liver

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Alcoholic liver disease (ALD) is characterized by a fatty liver, hepatitis, fibrosis, and cirrhosis. Binge drinking is on the rise worldwide, and is particularly common in the U.S. A review of studies addressing the effects of binge drinking on the liver underscores the complex interactions among various immune, signaling pathways, epigenetic, and metabolic responses of the liver to binge drinking.

Results will be published in the April 2013 issue of *Alcoholism: Clinical & Experimental Research* and are currently available at Early View.

"The liver is the main metabolic site in the body," said Shivendra D. Shukla, Margaret Proctor Mulligan Professor at the University of Missouri, School of Medicine as well as corresponding author for the study. "It is involved in nutrient and drug metabolism and disposition, and in the production of a myriad of agents needed for the physiological functions of organs such as the heart, kidney, blood vessels, and brain. ALD-affected liver chemicals can also influence immunity, cardiovascular health, and coagulation. Thus, ALD can have a 'domino effect' on many organs."

"The liver is also the major organ for alcohol metabolism, and as such, is the first line of defense against excessive alcohol consumption," added Samir Zakhari, senior vice president in the Office of Science at Distilled Spirits Council of the United States. "The effects of binge drinking on the liver depend on whether binge drinking is superimposed on chronic heavy drinking, or is done on an empty stomach especially after a period

of fasting or starvation."

"Binge abuse is on the rise globally," said Shukla. "For example, about 43 percent of college students have reported at least one binge episode during the previous months. It is therefore necessary to fully understand its consequences at molecular levels. This is the first review that highlights the molecular pharmacology of binge drinking and how this may offer insight into binge-induced injury and its wider implications."

Some of the review's key themes are:

- Binge consumption of alcohol is implicated in the pathophysiology of ALD. New studies from both experimental animals and humans indicate that binge drinking has profound effects on immunological, signaling, and epigenetic parameters of the liver. This is in addition to the known metabolic effects of acute levels of alcohol.
- "Chronic alcohol consumption renders the liver highly susceptible to binge-induced liver damage," said Shukla. "Binge-induced liver injury impacts other organs as well, a view rather poorly appreciated by the public."
- Binge drinking alters the levels of several cellular components and dramatically amplifies liver injury in the chronically alcohol-exposed liver.

"This review, the first of its kind, emphasizes the importance of molecular and epigenetic mechanisms in binge-induced liver injury," said Shukla. "This review also sets the stage for additional investigations in this field. The cross-organ implications of binge-induced liver damage must be explored."

"Binge drinking influences all the mechanisms mentioned above, but can

also cause mitochondrial damage, which may result in cell death and disturbances in bioenergetics," added Zakhari. "Therefore, people should not binge drink, especially on an empty stomach, and if they are chronic heavy drinkers, binge drinking will exacerbate liver injury, especially if comorbid conditions such as obesity, Hepatitis C, or HIV infection exist."

The authors stress the importance of additional molecular investigations into the binge effects of alcohol for a better understanding of ALD. They also suggest that future research address the development of therapeutic strategies to control binge drinking.

"Our review highlights the effects of ALD on multiple molecules that in turn have effects on various organs," said Shukla. "We hope this will encourage research and development of newer approaches and tools to control and ameliorate binge-induced health effects."

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