

# Alcohol: How Much is Safe— —in the presence of excess iron?

**Alcohol modifies liver function.** Modification of function can range from sluggish metabolism to fibrosis, cirrhosis, and eventually liver cancer, and death. Just how rapidly disease develops depends on several factors: gender, weight, age, personal habits—smoker, drinker, diet, environment, and whether or not one has another form of liver disease.

**Who is at risk?** Those with already compromised health due to disease such as cancer, or viral infection such as AIDS, Viral hepatitis B and C, fall into this high risk category. Also at risk are individuals with hereditary hemochromatosis, Wilson's disease (copper overload), or anyone who has excessive iron levels due to other conditions such as transfusional iron overload. In these individuals alcohol will hasten the progression of disease.

**Why do gender, weight and age matter?** Mostly it has to do with bioavailability and absorption of alcohol. Females or very small males, teenagers, youths, and those sixty-five years of age and older have less body fluid and therefore become affected by alcohol much sooner. Additionally, females have less of the enzyme alcohol dehydrogenase. This enzyme is present in the stomach where the first step in alcohol metabolism occurs. For this reason, when consuming exactly the same amount of alcohol, females will have higher blood alcohol levels as compared to males of comparable body weight and size.

**How is alcohol metabolized?** The vast portion of alcohol metabolism, approximately 95%, takes place in the liver. As alcohol is burned or metabolized the reaction causes the liver to produce higher levels of an enzyme called P450. P450 is a natural and vital iron containing protein. It is contained in every type cell of the human body except a red blood cell. It is integral to the metabolism of fat-soluble vitamins, fatty acids, steroids, and many drugs. However P450 enzyme at these high levels—up to ten times normal—creates an environment where injury to the liver can take place due to gain of function.

**Gain of function** speeds up metabolism. The dangers of gain of function are great when alcohol is used in combination with drugs. Drug therapeutic ranges are narrowed by gain of function. For example: acetaminophen taken in conjunction with alcohol can overwhelm the body's ability to metabolize the drug. Too much of the drug is rushed into the system, which results in drug toxicity.

The late Dr. Charles Lieber, clinical nutritionist of the Mt. Sinai School of Medicine in New York conducted a study of people who had rich diets supplemented with minerals and vitamins including iron. These individuals were given a daily dose of alcohol that was less than the amount

needed to produce intoxication. After 18 days, subjects showed an eight-fold increase in liver fat, the pre-condition for cirrhosis.

Dr. Thomas Kresina, Division of Basic Research, National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Bethesda, Maryland states *“There is no way to accurately define a safe level for alcohol consumption. It is best to consider these issues on an individual basis depending upon risk. Those high at risk are individuals with any type liver disease or any disorder that makes one more susceptible to liver disease such as hemochromatosis, diabetes, AIDS, and obesity. For those in a low risk category, moderate drinking is considered to be: two drinks per day for males and one drink per day for females and those older than 65 years of age regardless of gender.”*

Most experts agree iron and alcohol together do more harm than either one by itself. Therefore those with any disorder where liver function can be affected such as iron-loading conditions, viral hepatitis, Wilson's disease (copper overload) porphyria cutanea tarda (PCT), chronic infection and diabetes should not consume alcohol. Individuals who do are increasing their risk of cancers of the mouth, larynx, pharynx, esoph-

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agus, liver, pancreas, colon, rectum, and female breast.

**Approximately 20-30% of alcohol misusers acquire up to twice the amount of dietary iron as do normal persons. These iron-loaded individuals are at increased risk for the same diseases as are hemochromatotic persons.**

For additional information about alcohol and ways to cease or cut back consumption, visit: [www.nih.gov](http://www.nih.gov) go to NIAAA section.

## REFERENCES

—Adams, Paul “Alcohol in hereditary hemochromatosis additive hepatotoxic effect *Hepatology*. 1996 23: p 724 .  
—Bonkovsky HL, Banner BF, Lambrecht RW, Rubin RB. Iron in liver diseases other than hemochromatosis. *Seminars in Liver Disease*. 1996 16(1):65-82.  
—Ioannou GN, Weiss NS, Kowdley KV. Relationship between transferrin-iron saturation, alcohol consumption, and the incidence of cirrhosis and liver cancer. *Clinical Gastroenterology & Hepatology*. 2007(5):624-9.  
—Jensen TK, Hjollund NH, Henriksen TB, Scheike T, Kolstad H, Giwercman A, Ernst E, Bonde JP, Skakkebaek NE, Olsen J. Does moderate alcohol consumption af-

fect fertility? *British Medical Journal*. 1998 317 (7157):p 505-506 .  
—Mumenthaler, Martin, et al, Gender differences in moderate drinking effects *Alcohol Research & Health*. 1999 23:p55.  
—Pietrangelo A. Hereditary hemochromatosis: pathogenesis, diagnosis, and treatment. *Gastroenterology*. 2010 139(2):393-408, 408.e1-2.  
— Testino G, Borro P. Alcohol and gastrointestinal oncology. *World Journal of Gastrointestinal Oncology*. 2010; 2(8):322-5.  
—Tuoi Do TH, Gaboriau F, Ropert M, Moirand R, Cannie I, Brissot P, Loréal O, Lescoat G. Ethanol Effect on Cell Proliferation in the Human Hepatoma HepaRG Cell Line: Relationship With Iron Metabolism. *Alcohol Clinical & Experimental Research*. (Abstract) 2010 Dec 8. doi: 10.1111/j.1530-0277.2010.01358.x.

...those with any disorder where liver function can be affected such as iron-loading conditions, should not consume alcohol.

**Standard drink is defined as**  
**13.5 grams of alcohol: or**  
**12 oz. Beer**  
**5 oz. Wine**  
**1.5 oz. distilled spirits.**

