

Use of Copper Mugs in the Serving of Alcoholic Beverages

INTRODUCTION

The purpose of this bulletin is to advise licensees and permittees selling and serving alcoholic beverages in copper mugs of the applicable federal guidance and state regulations regarding the use of copper and copper alloys in contact with food and beverages.

BACKGROUND

The recent popularity of Moscow Mules, an alcoholic cocktail typically served in a copper mug, has led to inquiries regarding the safe use of copper mugs and this beverage. The use of copper and copper alloys as a food contact surface is limited in Iowa.

DISCUSSION

Iowa, as well as many other states, has adopted the federal Food and Drug Administration's Model Food Code, which prohibits copper from coming into direct contact with foods that have a pH below 6.0. Examples of foods with a pH below 6.0 include vinegar, fruit juice, or wine.

The pH of a traditional Moscow Mule is well below 6.0. This means that copper mugs that have a copper interior may not be used with this beverage. However, copper mugs lined on the interior with another metal, such as nickel or stainless steel, are allowed to be used and are widely available.

For more information on this topic, contact the Iowa Department of Inspections and Appeals Food and Consumer Safety Bureau online at <https://dia.iowa.gov/contact-us> or via telephone at (515) 281-6538.

APPLICABLE LAWS/RULES/REGULATIONS

[4-101.14 Copper, Use Limitation.](#)

(A) Except as specified in ¶ (B) of this section, copper and copper alloys such as brass may not be used in contact with a food that has a pH below 6 such as vinegar, fruit juice, or wine or for a fitting or tubing installed between a backflow prevention device and a carbonator.

(B) *Copper and copper alloys may be used in contact with beer brewing ingredients that have a pH below 6 in the prefermentation and fermentation steps of a beer brewing operation such as a brewpub or microbrewery.*

Public Health Reasoning:

High concentrations of copper are poisonous and have caused foodborne illness. When copper and copper alloy surfaces contact acidic foods, copper may be leached into the food. Carbon dioxide may be released into a water supply because of an ineffective or nonexistent backflow prevention device between a carbonator and copper plumbing components. The acid that results from mixing water and carbon dioxide leaches copper from the plumbing components and the leachate is then transferred to beverages, causing copper poisoning. Backflow prevention devices constructed of copper and copper alloys can cause, and have resulted in, the leaching of both copper and lead into carbonated beverages.

Brass is an alloy of copper and zinc and contains lead which is used to combine the two elements. Historically, brass has been used for items such as pumps, pipe fitting, and goblets. All 3 constituents are subject to leaching when they contact acidic foods, and food poisoning has resulted from such contact.

The steps in beer brewing include malting, mashing, fermentation, separation of the alcoholic beverage from the mash, and rectification. During mashing, it is essential to lower the pH from its normal 5.8 in order to optimize enzymatic activity. The pH is commonly lowered to 5.1-5.2, but may be adjusted to as low as 3.2. The soluble extract of the mash (wort) is boiled with hops for 1 to 22 hours or more. After boiling, the wort is cooled, inoculated with brewers yeast, and fermented. The use of copper equipment during the pre-fermentation and fermentation steps typically result in some leaching of copper.

Because copper is an essential nutrient for yeast growth, low levels of copper are metabolized by the yeast during fermentation. However, studies have shown that copper levels above 0.2 mg/L are toxic or lethal to the yeast. In addition, copper levels as low as 3.5 mg/L have been reported to cause symptoms of copper poisoning in humans. Therefore, the levels of copper necessary for successful beer fermentation (i.e., below 0.2 mg/L) do not reach a level that would be toxic to humans.

Today, domestic beer brewers typically endeavor to use only stainless steel or stainless steel-lined copper equipment (piping, fermenters, filters, holding tanks, bottling machines, keys, etc.) in contact with beer following the hot brewing steps in the beer making process. Some also use pitch-coated oak vats or glass-lined steel vats following the hot brewing steps. Where copper equipment is not used in beer brewing, it is common practice to add copper (along with zinc) to provide the nutrients essential to the yeast for successful fermentation.