

**ALCOHOL IN FOOD ACCORDING TO SCIENTIFIC AND ISLAMIC PERSPECTIVE  
AND ITS NEUROPSYCHIATRY EFFECTS**

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<b>Abstract</b>	<p><i>In Islam, the consumption of alcohol is generally considered haram, which means it is forbidden or prohibited. There are rules that have been identified by jurists in measuring the halal or haram status of a product. There are permissible alcohols in food that are allowed to be consumed. The Istihalah concept is generally implemented by Islamic scholars in order to characterize the permissible alcohol present in food. Alcohols are among the most common organic compounds, identified by one or more hydroxyl (-OH) groups attached to a carbon atom of an alkyl group. Excessive alcohol consumption and alcohol drinking during adolescence specifically are the risk factors for the development of alcohol use disorder (AUD), anxiety, and other neuropsychiatric conditions during adulthood. It has been reviewed that neuropsychological testing of selective cognitive, sensory, and motor functions has enabled tracking the consequences of AUD, which involve the corresponding disruption of selective functions with respect to response inhibition, visuospatial, emotional, postural stability, mnemonic, and brain system supporting these functions. The nervous system is one of the structures that is most sensitive to alcohol. Alcohol affects the brain's communication pathways, hence inducing brain and nervous system problems. Herein, a review with regard to alcohol in food from an Islamic perspective and its neuropsychiatry consequences will be discussed accordingly.</i></p> <p>Keywords: <i>Alcohol, Food, Neuropsychiatry Effects, Islamic Perspective.</i></p>
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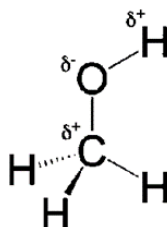
**INTRODUCTION**

From a chemist's perspective, alcohol denotes an organic compound characterized by a specific arrangement of carbon, hydrogen, and oxygen atoms identified by one or more hydroxyl (–OH) groups attached to a carbon atom of an alkyl group. In contrast, for the general populace, alcohol serves as a colloquial term primarily associated with alcoholic beverages like wine, beer, whiskey, vodka, tequila, and similar libations. These alcoholic beverages hold a significant presence in the customs and traditions of many cultures worldwide, except for those adhering to religion that proscribe alcohol consumption (Burhanuddin et al., 2021). Over the past few decades, numerous studies have demonstrated that excessive alcohol consumption leads to brain damage and related diverse cognitive impairments. This study aims to explore the chemistry of alcohol, its

neuropsychiatric repercussions and subsequently discuss on the use of alcohol in food from Islamic viewpoint.

### Chemical Composition of Alcoholic Beverages

In Chemistry, alcohols are among the most common organic compounds, identified by one or more hydroxyl ( $-OH$ ) groups bonded to  $sp^3$  hybridised carbon. Because of the presence of  $-OH$  group, alcohols are polar compounds, with partial positive charges on carbon and hydrogen and a particular negative charge on oxygen (Figure 1).



Partial charge notation

Figure 1: Chemical structure of methanol with partial charge notation.

According to the Islamic jurisprudence, ethanol ( $CH_3CH_2OH$ ) is the main component of most alcoholic beverages (*khamr*) and the main cause of alcohol intoxication. Ethanol can be produced from fermentation of carbohydrates using yeast. Often, the carbohydrates are from grapes and various grains such as barley and wheat. Fermentation alone does not produce beverages with ethanol content greater than 15% (Dasgupta et al., 2021). It is because the enzymes that come from the yeast are deactivated at higher concentrations. To produce beverages with higher alcohol content (*khamr*) such as brandy, whiskey, and vodka, the aqueous solution must be distilled.

Ethanol also can be synthesized from ethylene derived from cracked petroleum hydrocarbons. The alcoholic beverage industry has commonly refrained from utilizing synthetic ethanol produced from ethylene in alcoholic beverage production due to concerns about impurities. To discern the use of synthetic ethanol in product fortification, low  $^{14}C$  content of synthetic ethanol is employed as a distinguishable marker in quality control analyses. Ethanol is also toxic, but it is much less toxic than methanol. Ethanol also known as hypnotic (sleep producer) because it depresses activity in the upper brain even though it gives the illusion of being a stimulant. Some physical and chemical properties of ethanol are shown below (Chemeurope.com, n.d.):

Description	: Clear and colorless liquid
Boiling point	: 78.5 °C
Melting point	: -114.1 °C
Density	: 0.789

It is essential to have a proficient analytical capability especially when analyzing the concentration of ethanol at extremely low levels in food and beverages. This includes having a properly equipped laboratory with qualified personnel and accredited in accordance with ISO/IEC 17025 standards (Mansur et al., 2022). Several laboratory-developed methods have been used for assessing the ethanol content in processed foods and beverages. Each of these methods utilized a distinct array of analytical tools.

Mansur and colleagues (2022) employed headspace gas chromatography (HS-GC) method to measure the concentration of ethanol in foods and beverages. Sisco and Robinson (2020) suggested direct analysis in real time mass spectrometry (DART-MS) for determination of the ethanol concentration in beverages. The use of DART-MS for analyzing

ethanolic beverages has been demonstrated as a swift and dependable substitute for the conventional HS-GC analysis method. A non-spectroscopy-based technique employing Enzytec™ Liquid Ethanol has also been studied by Lacorn et al. (2023). A rapid detection of ethanol concentration using Portable Electronic Nose (E-Nose) was also developed for food analysis (Asyikeen et al., 2017).

### **Neuropsychiatry Effects**

Ethanol is one of the most common drugs which has been used in amounts that are harmful to human and classified as an abused drug. The excessive or addictive use of drugs will affect brain actions in the form of chronic changes in behaviour including compulsive seeking, tolerance and dependence. Chronic ethanol exposure and alcohol use disorder (AUD) have an even more significant negative impact on society such as loss of employment, psychiatric symptoms, obvious neurotoxicity, liver failure, and severe cognitive disruption (Center for Behavioral Health Statistics and Quality, 2016). According to World Health Organisation (WHO), the global consequences of AUD include 3.3 million annual deaths (5.9% of all deaths) and 5.1% of the burden of disease and injury (Sacks et al., 2015).

The past decades of research have revealed brain structural and functional abnormalities associated with AUD. After alcohol detoxification, neuropsychological investigations revealed that 50-80% of AUD patients accounted with cognitive and motor impairments characterized by a distinct heterogeneity in the pattern and the severity of deficits (Petit et al., 2017). Neuropsychological domains such as motor and executive functions, global cognitive functioning, visuospatial abilities, memory, and social cognition could be impaired and may be partially or totally recovered with sobriety which living a life free of drug or alcohol (Stavro et al., 2013). Essential factors in contributing to AUD impairments is alcohol history which includes the total amount of alcohol consumed over a lifetime, recent alcohol consumption, and duration of AUD.

Korsakoff's syndrome (KS) is an alcohol-related neurological complication due to the combination of chronic and heavy alcohol consumption and thiamine deficiency (Anne-Pascale et al., 2019). Generally, KS is related to a memory disorder that results from vitamin B1 deficiency and damages nerve cells and supporting cells in the brain and spinal cord, as well as the part of the brain involved with memory. Besides, heavy drinking habits are also associated with visuospatial abilities which is the person's capacity to identify visual and spatial relationships among objects being interrupted.

Cerebral cortex is the region responsible for the drunk person to feel inhibited. It is the area of the brain that merges thought processing and consciousness of a person. Alcohol depresses the behavioral inhibitory centres, making the person less inhibited. The process of information from the eyes, ears, mouth and other senses is slowed down which results in inhibition of the thought processes. Thus, making drunk people difficult to think clearly (Hampson., 2017).

Additionally, alcohol works by inhibiting parts of the brain that usually make us anxious, worried and aware of the consequences of our actions (Oscar-Berman & Marinkovic, 2003). While alcohol is a depressant, it also acts as a stimulant which directly affects the brain's chemistry by altering levels of neurotransmitter. Neurotransmitters are often referred to as the body's chemical messengers that transmit signals via brain neural pathway around body, delivering different commands with one another and with their target tissue.

Figure 2 shows the parts of the brain associated with specific functions and nerve cells (neurons) connect one area to another via pathways to send, receive, and integrate important information. Extended studies and integrative approach employing various neuroscientific technologies is needed and essential for recognizing the interrelationship of the neuropsychiatric systems affected by alcoholism.

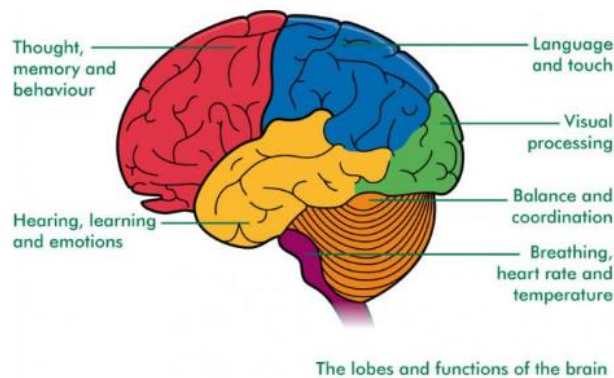


Figure 2: Parts of the brain associated with specific functions  
(Bruna Cunha & Richard Lynas, n.d.).

### Islamic Perspective for Food Containing Alcohol

The word "alcohol" in Arabic comes from the word "al-kuhl" (الكحل) which means essence. It is a flammable and intoxicating liquid (found in liquor etc.). It also means liquor (Noresah, 2007). Based on the use of the term alcohol in the Arabic language or the language of the Quran, it is known as al-khamr. Dr. Yusuf al-Qaradawi (1977) also mentions alcohol to define wine. He explained that alcohol is any intoxicating drink made from grains or fruits by processing until it reaches an intoxicating alcohol level. According to Ibn Manzur's view, it is called wine because it closes the mind from thinking and removes the power of judgment for the drinker (Ibn Manzur, 1993). Wine is a drink that can destroy a person's sanity, disturb the mind, and can lead to immoral or dangerous actions.

Earlier verses of the Qur'an prohibited alcohol made from grapes only, but the prohibition included all intoxicating substances. This is based on a hadith from the Prophet SAW:

{ كُلُّ شَرَابٍ أَسْكَرَ فَهُوَ حَرَامٌ }

Which means, "Everything that intoxicates is forbidden" (Hadith. al-Bukhari. 5263; Muslim. 2001)

This hadith explains the meaning of alcohol, which is all things that intoxicate. All things that are intoxicating no matter what their name is, the law of drinking them is the same as the law of alcohol, which is haram. According to the consensus of scholars, the prohibition of alcohol is because it is intoxicating. Therefore, the prohibition must be the same for all intoxicating drinks without distinction whatever their origin (JAKIM, 2017).

The wisdom of why Islam forbids intoxicating drinks is that it often reduces a person's ability to control themselves, which can lead to unwise or dangerous actions. Therefore, Islam really wants to maintain the stability of human life, whether as an individual or as a member of society, depending on the perfection and strength of reason. However, Sharia does not prohibit eating medicines that contain alcohol in small quantities or as a solvent for half medicines that cannot dissolve in water. In addition, it is permissible to eat foods that contain dyes and flavorings that use ethanol as a solvent in their manufacture (Wahbah al-Zuhayli, 1997).

Alcohol can be produced through the fermentation process either by natural and industrial (synthetic) (Harahap et al., 2020). In the alcoholic fermentation process, there is several types of products that can be produced either in the form of juice, wine and vinegar. The resulting alcohol content is also different and gives legal implications that are also different. To determine the status of alcohol products that varies, Istihalah can be used as one of the methods more accurate determination of the law.

*Istihalah* is a word originated from يستحيل استحالة which means a transformation. In term of terminology, it defined as the alteration and exchange of one substance into another

along with the alteration its appearance and characteristics. In another word is the transformation of unclean things such as wine, pork, and virginity to something else by pickling, or burning, or by falling into something pure (Al-Khatib, n.d.). It may be understood from what Ibn Abidin (n.d.) said that the transformation according to the Hanafis is change, and the reversal of the substance. Al-Mubarakfuri (n.d.) said: "There has been disagreement regarding the purity of *Al-Jalalah's* milk". The majority are on purity, because impurity is transmutable in its interior, so it appears by transmutation as blood transmutes in animal parts into flesh and becomes milk which it is clearly understood that transmutation transforms the nature and the name.

In general, scholars conceptually agreed with the theory of *Istihalah*. However, they disagreed on aspects of its implementation and usage. This difference is parallel to agent acceptance changes either naturally or unnaturally through mixing human hand or synthetic. For example, there is no difference in opinion among the scholars regarding the fact that if wine naturally transformed into vinegar, it is pure and permissible to drink it. That is because the Prophet SAW said (Muslim, 36):

{ نِعْمَ الْإِدَامُ الْخَلُّ }

Which means, "*The most excellent of condiments is vinegar*" (Hadith. Muslim. 36).

The great difference among scholars is about the transmutation that is accomplished by human action through the addition of chemical substances that transform matter and change it from one state to another, or for any other reason whatsoever.

The first view that extends its application is from among the Hanafi madhhab, Maliki, Ibn al- Arabi, Ibn Taymiyyah, Ibn al-Qayyim, al-Syawkani and Ibn Hazm al-Zahiri. They realized the theory of *Istihalah* in more general scope. This is because they accept this theory as one a process that can transform an unclean thing into something equally sacred there occurs naturally as through the process of fermentation of wine becomes vinegar or unnatural by mixing with other ingredients.

Ibn Nujaym (1998) describes in the book of *al-Bahr al-Ra'iq*: Among the things that can be sacred is something that mixed with feces when its substance changes. For example pigs and carcasses falling into the ocean salt and turns into grains of salt, then the salt edible. In addition, animal feces when burned changes becomes ash, it also becomes clean after going through the process *Istihalah*. This is the opinion of Muhammad al-Syaybani .

The second view narrows the application of *Istihalah* theory to certain aspects only. This view is supported by scholars from among the Syafie madhhab and one of the views of the Hanbali madhhab. Madhhab Syafie thinks that a substance which is unclean cannot be sanctified by alteration its nature except in three cases (al-Hadrami, n.d.). First, the wine which turns into vinegar by itself (Al-Sharbini, 1994). Second, the skins of dead animals other than dogs and pigs become sacred when tanned (Al-Shirazi, 1995). The third is something that turns into animals such as carcasses turn into caterpillars because of the occurrence of a new life (Al-Zuhayli, 1997).

According to National Council of Alcohol in Food, Beverage, Fragrance and Medicine by Fatwa Committee of the National Fatwa Council for Islamic Religious Affairs Malaysia (14-16 July 2011):

"Every wine contains alcohol. However not all alcohol are wine. Alcohol that is extracted from the wine making process is ruled as prohibited (haram) and impure.

However, alcohol that is not produced through the wine making process is not ruled as impure, but is still prohibited (haram) from being consumed in its original form as it is a poison and can kill.

Soft beverages processed/made not for the purpose of producing wine and containing alcohol below the level of 1% v/v are permissible to be consumed.

Whereas for soft beverages made with the same intention and method of producing wine, regardless of whether their alcohol content is high or low or whether their alcohol content is distilled, their consumption is prohibited.

Food or beverages containing natural alcohol such as fruits, nuts, grains or their juices, or alcohol that incidentally forms during the production process of certain food or beverages is not considered impure and is permissible to be consumed.

Food and beverages with flavouring or colouring that contains alcohol for stabilisation purposed are permissible to be consumed provided that the alcohol is not produced from the wine making process. The quantity of such alcohol in the final product is not intoxicating and the alcohol level does not exceed 0.5%.

Medicines and perfumes containing alcohol as a solvent agent are not impure and are permissible provided such alcohol is not extracted from wine making process.”

From the fatwa statement above, we can see the rate permissible alcohol standards in food must be not exceeding 0.5% or a maximum of 1%. We also noticed that a large number of scholars trying expanding the application of *Istihalah* while some others narrow it on certain aspects.

## CONCLUSION

Excessive and imprudent consumption of alcohol results in deficiency in attention, memory, executive functions, visuospatial and motor skills. Due to the negative implications which lead to various health problems, specifically in neuropsychiatric systems, Islam has prohibited the consumption of alcohol in which it will be holistically beneficial in accordance with Islamic perspectives.

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