Camellia Newsletter

Vol. 176 December 20, 2017

An excessive intake of alcohol causes adverse effects to the intestinal environment!

by Muneaki Takahata Ph.,D.

Women should be aware of alcoholism even though the amount of alcoholic intake is small

According to the report of "Alcohol and Health 2014" which was published by the World Health Organization (WHO) in 2014, 3.3 million people around the world die annually from alcohol. The average intake of alcohol in people over 15 years old worldwide is 6.2 liters per year. This is the equivalent of drinking one can of beer per day. The number of people who drink alcohol has been continuously increasing and 38.3% of drinkers take 17 liters of alcohol per year (which is equal to 2.6 cans of beer per day).

In Japan, the average intake of alcohol is 7.2 liters per year. 36.9% of men and 12.0% of women who have a drinking habit drink more alcohol than the average. In other words, more than one in three Japanese men take alcohol excessively. Furthermore, the intake rate of alcohol in women have been increasing year by year. According to the research of the drinking rate by gender which was done by the Ministry of Health and Welfare in 2008, the drinking rate of women aged between 20 to 24 years old was 90.4% and the rate for men from the same age demographic was 83.5%. The rate for women was greater than the one for men. The ability to decompose alcohol is proportional to the size of the liver. The organs in the female body are relatively small and have a lot of fat, but the female body keeps less moisture than its male counterpart. Therefore, women tend to fall into acute alcohol poisoning. Women have a high possibility of getting alcohol poisoning even if the intake volume is small.

Alcohol poisoning will develop various diseases including damages to the tissues by alcohol, organ dysfunction (alcoholic liver disease), an increased risk of developing cancer, immunodeficiency, an increased risk of acute and chronic diseases, pancreatic disease, heart

disease and cardiovascular disease. In these circumstances, the relationship between the intake of alcohol and the structures and the change in functions of gut microbiota has begun drawing people's attention.

A large intake of alcohol exacerbates the condition in intestines

Following the concern about the effects of alcohol on the body and intestines, research studies in animals and humans have been progressing. In a study with mice, the group that ingested alcohol developed alcoholic hepatitis. The onset of alcoholic hepatitis is associated with bacterial overgrowth in the small intestine and the dysfunction of the appendix. Furthermore, the gut microbiota in the intestines of mice with alcohol was changed compared to that of healthy mice.

Another study has found that the composition of ileal mucosa-associated bacterial flora changed in rats which were given alcohol every day for 10 weeks and caused disorders in ileal and colon. Another other study in 2009 has reported that the levels of intestinal oxidative stress and intestinal permeability were increased with alcohol-treated mice, and they also developed endotoxemia and steatohepatitis. This is because the changes in alcohol-induced microorganisms contributed to the disorders in intestines and the liver, potentially contributed to hepatic disorder by damaging integrity of intestinal barrier, and increased the production of proinflammatory factors that may promote the pathology in the liver by raising the intestinal permeability.

According to the report with human studies, unintended bacterial overgrowth and dysbiosis (abnormalities of microbiota) are induced by chronic alcohol ingestion. Aerobic and anaerobic bacteria in the jejunum grow excessively with alcohol. Another study has found the changes in composition of mucosa-associated microorganisms during a biopsy of sigmoid taken from healthy subjects and alcoholic subjects with and without alcoholic hepatitis. In this study, regardless of the presence or absence of alcoholic hepatitis, a significant change in the microbiota of alcoholic subjects have been found.

In other studies, a higher level of endotoxin (bacterial toxin) was found during the blood test after alcohol ingestion. This is because the permeability of intestines was increased by dysbiosis and endotoxin was produced due to an increment of bad bacteria (gram negative bacteria) in the intestines. The produced endotoxin passed to the blood from the intestines which resulted in a high level of endotoxin in the blood.

The examination of faecal flora among human subjects with hepatitis B or alcoholic cirrhosis has shown a decrease in Bacteroidetes, Proteobacteria, and Fusobacterium compared to the healthy subjects. More finespun analysis has demonstrated that Prevotellesae, Enterobacteriaceae, Veillonellaceae and Streptococcaceae increased significantly in the subjects with alcoholic cirrhosis. Whether such changes in the microbiota are directly involved in the diseases requires further research studies. However, the fact that the subjects with alcohol intake have a different microbiota from healthy individuals is very interesting.

Changes in the microbiota due to alcohol consumption increase the risk of cancer

A collaborative research between the Tohoku University, the National Cancer Center and other institutions have studied the characteristics of gut microbiota of alcoholic patients. As a result of comparing the microbiota of 16 alcoholic patients and 48 healthy subjects, the number of bacteria that can grow in an environment with oxygen increased among the alcoholic patients. Normally, the oxygen concentration is very low in the intestines of healthy people and the bacteria that cannot grow in the environment with oxygen are predominant in the large intestine. These predominant bacteria include Bifidobacterium and good Clostridium bacteria. However, Escherichia coli and enterococci, which can survive in an environment with oxygen, increased in the intestines of alcoholic patients.

Furthermore, the researchers have found that the number of bacteria, which is able to grow even in an environment with oxygen, increase when smoking is added to drinking alcohol. Drinking and smoking increase the level of reactive oxygen species (ROS) in the body. Researchers believe that ROS increased by the ingestion of alcohol cause disturbances of the gut microbiota.

Moreover, the gut microbiota of alcoholic patients has a very poor ability of dissolving acetaldehyde from alcohol. Acetaldehyde is a known cause of hangovers when it accumulates. Also, it is carcinogenic according to the study done by WHO. Now, researchers estimate that when the gut microbiota is disturbed by a mass intake of alcohol, the accumulated acetaldehyde increases which in turn rises the risk of colorectal cancer.

What can we do to associate with alcohol well?

The intake of alcohol may cause disorders of gut microbiota. However, it may provide a good effect to us depending on the type of beverage containing alcohol. For example, taking a moderate amount of red wine every day brings health benefits. It is reported that the polyphenols contained in red wine increase bifidobacteria within the gut microbiota of healthy individuals, promote the production of beneficial organic acids, and inhibit the growth of pathogenic bacteria. It is possible to incorporate good aspects of alcohol like the functionality of polyphenol by taking a small amount of alcohol.

The research teams in Australia and the United Kingdom have reported that moderate exercise may reduce the risk of death by drinking. According to the analysis of 353,049 men and women aged 40 years or older who have long-term records of their amount of exercise, amount of alcohol intake, history of illness and their health conditions, men with daily drinking of more than 2.4 units (2 units equal to 440 ml of beer or 175 ml of wine) and women with daily drinking of more than 1.6 units, increased their risk of death by 13%. However, this risk will be reduced if the people do moderate-intensity exercise (walking etc.) more than 150 to 200 minutes.

Even if the drinking amount is below a moderate alcohol consumption (Man: 17 to 39 units per week, Women: 11 to 29 units per week), the risk of death increases if there is little exercise or no fitness habit. A moderate-intensity exercise is known to increase good bacteria in the intestine. Continuous exercise is important in order to reduce health risks coming from drinking alcohol.

References:

- Sci Rep doi: 10.1038/srep27923. (2016)
  Ecophysiological consequences of alcoholism on human gut microbiota: implications for ethanol-related pathogenesis of colon cancer.
- Alcohol Res 37, 223-236 (2015)
  The Gastrointestinal Microbiome: Alcohol Effects on the Composition of Intestinal Microbiota.
- Br J Sports Med 51, 651-657 (2017)
  Does physical activity moderate the association between alcohol drinking and all-cause, cancer and cardiovascular diseases mortality? A pooled analysis of eight British population cohorts.