

...positively coffee

Newsletter from the International Coffee Organization



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Coffee and hydration - the facts

Somewhere in the world today it is a hot sunny day, and amongst all the warnings we are given about the consequences of such heat, there is always one about not becoming dehydrated.

The caffeine in coffee has a mild diuretic effect, increasing the frequency of urination but not the amount of fluid passed. For many years health and exercise experts thought that, as a consequence, coffee and other caffeinated beverages promoted dehydration and didn't count as a source of fluid in the diet. We now know this is not true and there is no scientific evidence to support these views. Caffeine in fact is no more a diuretic than water⁽⁶⁾.

The truth is that a moderate intake of coffee and other caffeinated drinks does not lead to dehydration and does count towards daily fluid intake.

How did this myth start?

The normal average daily loss of water is around 2500ml of which urine accounts for approximately half. A further 800ml is from water loss through the skin and most of the remainder is from the lungs. This amount will of course vary and, in conditions of extreme heat and exercise, daily fluid loss may exceed 10 litres as we sweat more.

Urine output is often used as an indicator of dehydration. Earlier studies^(1,2) only collected urine samples over a 2-4 hour period after caffeine consumption, not over 24 hours. It is now known that the period over which urine is collected is a significant factor. The small increase in urine output after 3 hours is compensated for by a decrease in output later in the day: i.e. total urine output over the day remains unchanged⁽³⁾. In one study⁽⁴⁾, the effect had already disappeared within 4 hours.

What is the latest evidence?

Professor Lawrence Armstrong, an avid runner and well respected scientist, decided to review the scientific literature to see whether abstaining from coffee and other caffeinated drinks was scientifically justifiable. In his published report⁽⁵⁾ he concluded:

- After drinking a caffeinated drink, the body does retain most of the fluid (up to 84% has been reported in some studies)
- Moderate consumption does have a mild diuretic effect, but the overall effect is very similar to water



Moderate intakes of caffeinated drinks have no long term effect on hydration and count towards daily fluid intake

- Regular consumers of caffeinated drinks have a higher tolerance to the diuretic effect
- There is no evidence that consuming caffeinated drinks causes an imbalance of fluids and electrolytes, such as sodium and potassium, in the body, or that it is detrimental to health or exercise performance.

In 2003⁽⁶⁾, a further review of scientific studies published between 1996 and 2002 concluded that: "The most ecologically valid of the published studies offers no support for the suggestion that consumption of caffeine containing beverages, as part of a normal lifestyle, lead to fluid loss in excess of the volume ingested or is associated with poor hydration status".

These conclusions are further supported in the most recent review⁽⁷⁾ where it was noted also that in relation to hydration, there was no evidence to support caffeine restriction.

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Coffee and cancer - what is the latest thinking?



A great deal is written on diet and all forms of cancer and recently researchers have suggested that we may be able to prevent about 35% of cancer cases by altering our diets. Each year 10.9 million people worldwide are diagnosed with cancer and there are 6.7 million deaths from the disease and, of these, nearly one million are in the EU⁽¹⁾. It is understandable when we see such figures, to expect that any possible relationship between what we do, what we eat and drink, and the risk of developing cancer, have been extensively studied. Coffee, as a popular beverage, has been included in such studies.

In 1991 the International Agency for Cancer Research (IARC), which is part of the World Health Organisation, classified coffee as being "possibly carcinogenic to bladder cancer" This classification was given because there was insufficient data available at the time to be more specific⁽²⁾. However the report also stated that drinking coffee might even help to protect against some forms of cancer. This resulted in many further studies being undertaken.

Since 1991, the results of those studies have shown data about four main cancer sites that would be of interest to coffee drinkers. They are bowel (colorectal), pancreatic, bladder and liver cancers.

Bowel cancer

The latest estimate is that about 2 out of 3 bowel cancers may be preventable by changes in diet and lifestyle, but there is no one diet that can guarantee you will not get bowel cancer⁽¹⁾.

Several studies have found that coffee consumption is related to a lower risk of bowel cancer. According to one study in Canada, the risk reduced as coffee drinking rose to five cups a day (especially evident in men)⁽³⁾. Another group of studies noted there was a 28% reduction in the risk of developing colorectal cancer for those drinking four or more cups of coffee daily as compared to those drinking less than one cup⁽⁴⁾.

This lower risk of colorectal cancer, among moderate and regular coffee drinkers, was observed consistently in over a dozen studies undertaken in a variety of settings in Asia, Northern and Southern Europe, and North America.

However there are a number of studies that did not reach this conclusion, but allowances were not made in those studies for other factors, such as smoking and alcohol consumption, which are known to have an impact on an individual's cancer risk.

How does it work?

Apart from increasing movement of food in the bowel, and thereby reducing the exposure time to cancer inducing substances in the colon⁽⁵⁾, coffee is believed to help reduce the output of bile acids, which are known to play an active part in promoting cancer in the colon⁽⁶⁾.

Coffee also contains several compounds with strong antioxidant properties (such as caffeic acid and chlorogenic acid^(7,8), and others - such as cafestol and kahweol - with anticarcinogenic activity⁽⁹⁾. Antioxidants are thought to play a significant role in protecting our cells and tissues from oxidative damage.



Pancreatic cancer

Most experts do not think there is a link between coffee and pancreatic cancer. Since the 1991 IARC Report, results of seven major studies have been published. No association emerged in a study of 17,633 American men⁽¹⁰⁾, or in another Norwegian study⁽¹¹⁾. Three other studies in the US involving 14,000 retired residents⁽¹²⁾, the Health Professionals Follow-up Study⁽¹³⁾ and the Nurses' Health Study cases⁽¹³⁾, all confirmed no association between drinking coffee and increased risk of cancer of the pancreas.

Some years ago some studies showed a possible link, but in one of those studies, when smoking was allowed for, the association with coffee was not considered statistically significant.⁽¹⁴⁾

One further study even found an inverse relationship showing that the risk of developing pancreatic cancer was reduced in coffee drinkers.⁽¹⁵⁾

Bladder cancer

Since the publication of the IARC Report in 1991, several studies have been undertaken on coffee and bladder cancer. One aspect of these studies was to try to establish whether the reported small association with coffee was the cause, or whether cigarette smoking, known to be a risk factor for bladder cancer, had been misclassified in those studies.

In an analysis of 10 European studies restricted to 564 non-smokers, there was no excess risk in coffee drinkers⁽¹⁶⁾. In a Norwegian study no significant association was seen between a high coffee consumption (greater than or equal to 7 cups per day) and the risk of developing bladder cancer, and these results applied to both men and women participating in the study⁽¹¹⁾. More recently, a study in the Netherlands identified 569 bladder cancer cases in a study population of 3,123 men and women⁽¹⁷⁾. After making allowances for other possible causes, no significant association between coffee consumption and the risk of developing bladder cancer was seen in men, but in women there was a significant inverse association i.e. a lower risk in those who consumed coffee.

So the large amount of data from a number of population studies on coffee and bladder cancer risk clearly excludes, after making allowances for other possible causes, a strong association between coffee consumption and the risk of developing bladder cancer. Where a moderate association is sometimes observed, it is possibly due to links with cigarette smoking and other factors.

Liver cancer

Coffee drinking has been shown to be inversely related to the risk of cirrhosis in studies from North America and Europe⁽¹⁸⁾ and, as cirrhosis is often a starting point for liver cancer, this is significant.

Several studies on a potentially favourable effect of coffee on liver cancer have also been published over the last two decades and the relationship between coffee drinking and the risk of primary liver cancer has been examined in at least six studies.

In one Japanese study of 334 subjects, who consumed coffee on a daily basis, results showed they had a lower risk of developing liver cancer than those who almost never drank coffee, and the risk decreased with the amount of coffee consumed. Compared with non-drinkers, the relative risk for those drinking 1-2 cups per day was a 50% reduction, whereas for those drinking more than 5 cups per day, it was a 75% reduction in risk⁽¹⁹⁾.



Coffee and cancer - continued

In a recent Greek study⁽²⁰⁾ of 333 subjects, results showed that those who drank around 3 cups of coffee a day (20 cups a

week) had a 30% reduction in risk compared to non-drinkers. In another hospital based study in Italy, involving 250 cases and 500 controls, similar conclusions were reached i.e. compared with non coffee drinkers, those drinking 1 - 2 cups per day reduced their risk by 20% whereas those drinking 3 - 4 cups reduced their risk by 60% and those drinking 5 or more cups per day had a 70% less risk of developing liver cancer⁽²¹⁾.

Finally, the findings of these studies were further endorsed when a pooled analysis consisting of over 60,000 people was undertaken⁽²²⁾. The findings confirmed a significant inverse association between coffee consumption and the risk of liver cancer.

How does it work?

Various components of coffee have been related to such a positive effect, including caffeine, coffee oils kahweol of cafestol, and antioxidant substances from coffee, but no definite evidence is available.

However, most scientists agree that it is probably the antioxidants in coffee, working in conjunction with caffeine that results in this positive effect. Caffeine is already known to help protect against liver cirrhosis and given the weight of evidence from population studies, coffee appears to have a real effect in reducing the risk of liver cancer.

Other cancers

The IARC Report included data on coffee and gastric cancer from five studies⁽²⁾. There was no evidence of association in any and further studies confirm that coffee is unlikely to have any major effect on gastric cancer.

Six studies providing data on cancers of the mouth, throat and oesophagus were considered in the IARC Report. There was no evidence of association with coffee consumption in any of them^(11, 23-26).

With relevance to breast cancer, again the IARC Report found no association with coffee consumption⁽²⁾. This was more recently confirmed, in several studies including an Italian study involving nearly 6,000 cases⁽²⁷⁾.

Likewise, no consistent relation was observed between coffee with ovarian, laryngeal, lung, prostate, cervical, endometrial and thyroid cancers, Hodgkin's

and non Hodgkin lymphomas, sarcoma, and skin melanoma^(28,29).

Conclusions

The large amount of data on bladder cancer allows us to exclude a strong association with coffee intake and, likewise, other scientific studies also strongly suggest no association between coffee and pancreatic cancer risk. For bowel (colorectal) cancer, most studies reported an inverse association i.e. a positive effect resulting from coffee consumption whereas evidence from population studies concerning liver, and probably oral and oesophageal, cancers consistently showed a positive effect with coffee consumption.

In an earlier major study involving over 15,000 men and women⁽³⁰⁾ the authors concluded:

"The most important findings reported here are the lack of positive associations between coffee drinking and any major cause of death and coffee not significantly increasing the incidence of any common cancer"

For more information about the references listed, visit "Coffee and Cancer" on www.positivelycoffee.org



Dr Astrid Nehlig is a research director at the French Medical Research Institute, INSERM, in Strasbourg. She has authored or co-authored over 250 articles, books and book chapters and is a regular speaker at international meetings and research centres. Her important research work was recognised in 2002 with an award from the American Epilepsy Society. Dr. Nehlig also acts as an expert for numerous scientific journals and international societies. These question and answers are taken from a recent interview with Dr Nehlig.

Coffee and mental performance

How does coffee affect mental performance?

Drinking coffee helps with the functioning of the brain. It helps increase alertness, attention and our ability to concentrate. It also helps us be less detracted by unwanted stimuli in our environment. Coffee also reduces the time we take to react to various stimuli.

At what time of day does coffee drinking have its greatest effect?

The greatest effects are seen in the morning when the need for a stimulus to get us going is greatest. Drinking coffee at this time helps increase our level of vigilance, alertness and well-being and puts us in a good mood for the start of the day.

I hear that there are also benefits for those suffering from Alzheimer's disease - is this true?

Yes, this is true. Recent investigations have shown that coffee helps prevent deposit of the substance that impairs brain function in those with Alzheimer's disease. One exciting new study has reported a 60-70% reduction in the incidence of Alzheimer's disease in people drinking 2 cups of coffee a day - compared to those drinking none - and this beneficial effect can be shown to be related specifically to coffee. However, more studies are needed to help us understand how this protective effect may work.

Recent reports concluded that drinking coffee helps prevent decline of awareness and judgment in older people. That sounds like very good news?

Yes it is. This report study involved 700 men, born between 1900 and 1920, from Finland, Italy and the Netherlands. The rate of decline in awareness and judgment, over a period of 10 years, was reduced in those men drinking coffee. This response was related to coffee intake and the least decline was seen in men drinking 3 cups of coffee a day. At this intake, the decline in awareness was four times less than in non-consumers. So, the study concluded that it is good advice for older people to drink coffee as it helps in many ways. Not only does it help hydration, often a problem in older people, but it is tasty, easy to drink and partly prevents loss of awareness and judgment, as long as the amounts consumed are reasonable, namely three to four cups a day.

How much coffee should I drink to benefit from all these positive effects?

About three to four cups a day. This will help increase alertness, concentration, and mental performance and helps you relax and put you in a good mood.

The growing awareness of these positive effects of coffee on well being is very exciting and we look forward to gathering more information on Alzheimer's disease, also Parkinson's Disease and possibly other areas of mental performance we are not yet aware of.

So how much should we drink?

Fluids are an important part of our diet and, to maintain our body's fluid balance, we should be drinking on average 6-8 cups (1.5 - 2 litres) of various liquids throughout the day. This will include caffeinated drinks such as coffee. The amount will need to be increased to around 8-12 cups (2-3 litres) in hotter weather, during and after exercise, or when experiencing high body temperatures associated with a fever.

Moderate intake of caffeinated drinks (250 - 300 mg caffeine/day - equivalent to 3-4

cups of coffee) will have no effect on hydration and will count towards this daily fluid intake⁽⁹⁾. This lack of any chronic effects on hydration was also confirmed over a longer period in another study⁽⁹⁾.

When we drink more fluids, our urine output is greater in response to that increased intake. Fluid balance is maintained as long as our intake matches our losses. However, the mechanism can be rather insensitive and we may already be slightly dehydrated before we are prompted to drink.

Conclusion

Despite being widely believed, the claim that caffeine-containing drinks promote dehydration is simply not true.

The latest evidence, published in scientific and medical literature, concludes that moderate intakes of caffeine (250-300mg/day), have no long term effect on hydration and can actually count towards daily fluid intake. According to Armstrong:

"Caffeinated fluids contribute to the daily human water requirement in a manner that is similar to pure water"⁽⁹⁾.

Good news for all of us who enjoy a cup of coffee as part of a healthy lifestyle to know that drinking coffee does make a positive contribution to that intake as well as contributing other health benefits.

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Coffee and hydration - some frequently asked questions



Many people still believe that drinks, which contain caffeine, such as coffee, tea and soft drinks, can act as a diuretic and promote dehydration. Here are answers to some frequently asked questions.

1 Drinks containing caffeine will cause your body to lose even more water than normal - true or false?

False. Despite what you often read in popular magazines and travel guides, there is no evidence to support this claim. In fact, a moderate intake of coffee and other caffeinated drinks does not lead to dehydration and makes an important contribution to daily fluid intake.

2 Caffeine containing drinks are a main cause of dehydration during the heat of summer - true or false?

False. The main factors affecting water loss from our bodies are surrounding air temperature and humidity. If the temperature increases, we sweat more and this loss is greater still if we undergo prolonged exercise in a warm environment.

3 How much water do we lose on average per day? (a) 1150 ml (b) 1800 ml (c) 2500 ml

The normal average daily water loss is around 2500 ml of which urine accounts for approximately half. 800ml is from water loss through the skin and most of the remainder is from the lungs. This will of course vary, and in extreme conditions of heat and exercise, daily fluid loss may exceed 10 litres.

4 So, what makes us thirsty?

We are consciously stimulated to drink when our blood volume falls and there is a rise in the concentration of sodium in the blood. This mechanism is rather insensitive in us and we may already be slightly dehydrated before we are prompted to drink.

5 Who might be at risk of dehydration?

People at particular risk of dehydration, and its consequences, are the very young and the elderly. Even physically active healthy children may be at risk during periods of hot weather. They have a relatively greater skin area, so sweat more to keep cool.

The elderly will often reduce fluid intake after lunchtime to avoid getting out of bed during the night. The sensation of thirst is often also reduced in elderly people, so they may not always drink enough to replace normal fluid losses.

There are also some occupations, such as fire fighting and some factory work, where those undertaking hard physical work in hot environments need to top up their fluid levels on a regular basis, as do we all when in hot and humid climates.

6 What are the signs and effects of dehydration?

Frequent headaches, tiredness, constipation and nausea, are all typical symptoms of dehydration. A dry mouth or dry lips are also indicators that our fluid intake is insufficient. Another useful guide is the colour of urine - it should be straw coloured.

Doctors also agree that ongoing mild dehydration does have a negative effect on general well being. Severe dehydration however is detrimental to health and is associated with the less efficient functioning of the heart and kidneys and generally makes us feel unwell.

7 Where do we get caffeine from in our diet?

Caffeine is present in many products. Main sources of caffeine in the diet come from tea, coffee, cocoa, chocolate, cola, and "high energy" drinks (specifically those which contain large amounts of caffeine as well as high levels of sugar).

8 What happens if you drink 3-4 cups of coffee a day - does your urine output stay increased?

No, regular consumers of caffeinated drinks, including coffee, have a higher tolerance to the mild diuretic effect, so the overall long term effect on hydration is very similar to water.

In the same way as we are advised to eat and enjoy a variety of foods, so we should enjoy a variety of drinks. Fluids are an important part of a healthy diet and we should be drinking at least 6-8 cups (1.5-2 litres) of fluid a day to maintain our body's fluid balance. Drinking coffee can make a positive contribution to that intake, as it has also been shown to have other health benefits.