

RESEARCH UPDATE

# Coffee and cardiovascular disease

*Latest research supports the association of moderate coffee consumption with reduced risk of cardiovascular disease (CVD) and mortality*



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## Overview

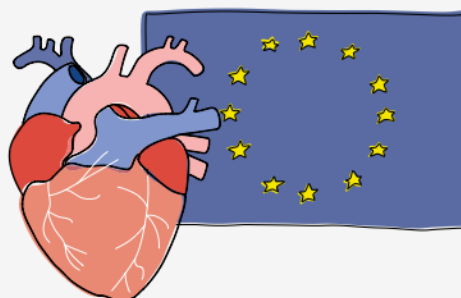
Cardiovascular disease (CVD) is an umbrella term describing all conditions that affect the heart and circulation, including coronary heart disease (CHD), hypertension, heart failure (HF), and stroke. Each of these conditions can be affected by various risk factors including blood pressure, cholesterol, blood vessel dilation and homocysteine levels, as well as lifestyle factors<sup>1</sup>.

CVD remains the leading cause of mortality and a major cause of morbidity in Europe. Currently, there are more than 6 million new cases of CVD in the EU and more than 11 million in Europe as a whole, every year<sup>2</sup>.

Diet, physical activity, smoking, and blood cholesterol levels are key CVD risk factors, whilst other risk factors, such as the prevalence of obesity and type 2 diabetes, have increased considerably in recent decades<sup>2</sup>.

Research into the associations between coffee consumption and health continue to evolve and this report updates current knowledge in the area of coffee and CVD.

**Almost 49m people are living with CVD in the EU, at a cost of ±€210bn a year<sup>2</sup>.**



***“Drinking moderate amounts of coffee is not only associated with a lower risk of heart disease, but also with living longer. These trends hold true for both people with and without cardiovascular disease. Coffee beans have over 100 biologically active compounds. These substances may help reduce oxidative stress and inflammation, improve insulin sensitivity and metabolism. The exact mechanisms of action in relation to CVD is, however, still not clarified.”***

PROFESSOR KJELD HERMANSEN, DEPARTMENT OF CLINICAL MEDICINE AT AARHUS UNIVERSITY, DENMARK

## Coffee and CVD mortality risk

Coffee is one of the most researched components of the diet and research suggests that a moderate intake of coffee may reduce CVD mortality risk<sup>3-7</sup>. Moderate coffee consumption can be defined as 3–5 cups per day, based on the European Food Safety Authority's (EFSA) review of caffeine safety<sup>8</sup>. A 2017 study of multiple health outcomes reported the largest relative risk reduction for cardiovascular mortality at intakes of 3–4 cups per day vs. none<sup>7</sup>.

### ***Latest research***

- A 2020 systematic review considered CVD and all-cause mortality in patients who have a previous myocardial infarction. The review concluded that coffee consumption was associated with a lower risk of CVD mortality and not associated with an increase in all-cause mortality. Furthermore, the review suggested that a significant non-linear dose response association can be found for moderate coffee consumption and all-cause mortality<sup>9</sup>.
- A 2021 study from the UK Biobank considered all-cause mortality and CVD mortality in relation to coffee consumption, concluding that those who were categorised as light-to-moderate coffee drinkers (0.5–3 cups per day) had a lower risk of all-cause mortality and CVD mortality when compared to non-coffee drinkers<sup>10</sup>.
- A further 2022 study using UK Biobank data supported these associations, concluding that coffee intake of 2–3 cups per day showed the lowest risk for CVD and all-cause mortality, whilst CVD mortality risk was lowest at 1 cup per day<sup>11</sup>.

## Coffee and CVD risk

A number of meta-analyses have reviewed the associations between coffee consumption and CVD overall, with many concluding that there is no association between coffee drinking and an increased risk of CVD<sup>3-7</sup>.

### ***Latest research***

- A 2020 prospective study of 20,433 middle-aged and older men from the Physicians' Health Study reviewed coffee consumption in relation to HF. The authors reported that they found no association between either coffee consumption or dietary caffeine intake and the risk of HF in this group of US male physicians<sup>12</sup>.
- A 2021 review, combining three diet domain studies, to identify potential risk factors associated with CHD, stroke, and HF showed higher coffee intake was associated with reduced risk of HF in all three studies<sup>13</sup>.
- A 2021 review of coffee consumption in those with diagnosed CVD including, hypertension, angina or heart arrhythmia, suggested this group were all more likely to drink less caffeinated coffee and to be non-habitual or decaffeinated coffee drinkers than those who did not report symptoms. The authors concluded that people tend to naturally self-regulate their coffee consumption, based on their own judgments<sup>14</sup>.

- Reviews published in 2020 and 2022 reported that moderate coffee consumption (2–5 cups per day) has been consistently associated with a lower risk of CVD<sup>15,16</sup>.

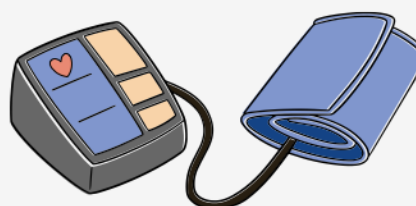


**Up to 5 cups of coffee per day may have promising benefits for lowering CVD risk<sup>15,16</sup>.**

- Furthermore, results presented at the 2022 European Society of Cardiology annual congress also showed a correlation between a higher voluntary daily consumption of caffeine (>280mg per day) from any source and significant reductions of incidences of cerebrovascular events, HF and arrhythmias in men. No association was found in women<sup>17</sup>.

## Coffee and hypertension

Research to date suggests that regular intake of coffee does not increase the risk of hypertension. A 2019 dose-response meta-analysis suggested a significant protective effect of coffee consumption on hypertension starting from the consumption of 3 cups of coffee per day<sup>18</sup>. A further 2018 systematic review considered a dose response effect suggesting that the consumption of coffee was inversely associated with the risk of hypertension in a dose-response manner. The hypertension risk was reduced by 3%, 5%, 8% and 10% for 2, 4, 6, and 8 cups per day, respectively, compared with individuals with no coffee intake<sup>19</sup>.



**The European Society of Hypertension (ESH) position statement on nutraceuticals and blood pressure, suggested that antioxidant rich beverages (teas, coffee) could be considered as being potentially useful choices in supporting healthy blood pressures<sup>21</sup>.**

### **Latest research**

- A 2021 review concluded that a moderate and habitual consumption of coffee (1–3 cups per day) does not adversely affect blood pressure in most people, including those with arterial hypertension. However, the authors did suggest that occasional, rather than habitual coffee consumption may have hypertensinogenic effects<sup>20</sup>.



## Coffee and cholesterol

The diterpenes cafestol and, to a lesser extent, kahweol, both naturally present in coffee oil, can raise the serum levels of both total and low-density lipoprotein (LDL) cholesterol. Whether these diterpenes permeate into brewed coffee, and to what extent, depends on the brewing method. For Scandinavian boiled coffee, cafetière (plunger pot), Greek and Turkish coffee, these components can pass into the brew, whereas they are largely retained in the paper filter in filtered coffee. Soluble coffee contains hardly any of these diterpenes. Espresso coffee contains approximately half the amount of diterpenes of unfiltered coffee; however, as it is served in small quantities, a moderate consumption of espresso coffee can be expected to have negligible effect on serum cholesterol levels (S-TC). The effects on cholesterol levels are transient<sup>22</sup>.

### Latest research

- A 2022 study demonstrated that espresso coffee consumption was associated with increased S-TC with significantly stronger association for men compared with women. Boiled/plunger coffee was associated with increased S-TC in both sexes and with similar magnitude as shown in previous research. Filtered coffee was associated with a small increase in S-TC in women<sup>24</sup>.

**In 2021, the European Society of Cardiology (ESC) included coffee for the first time in its updated guidelines on CVD prevention in clinical practice, stating that *'moderate coffee consumption (3–4 cups per day) is probably not harmful, perhaps even moderately beneficial'*<sup>23</sup>.**



## Coffee and atrial fibrillation

Atrial fibrillation (AF) is the most common cardiac arrhythmia and involves the two upper chambers (atria) of the heart. People with AF usually have a significantly increased risk of stroke. Research has not demonstrated an association between coffee consumption and risk of AF, and some studies have suggested that coffee consumption may have a protective effect<sup>26-28</sup>.

### Latest research

- A 2021 meta-analysis considered associations between coffee and caffeine intake and the incidence of AF. The authors concluded that caffeine consumption is unlikely to be related to the incidences of, or risk of developing new onset AF, and may offer a protective effect. They also suggested that to date any mechanisms for protective or causative effects of caffeine remain speculative<sup>28</sup>.

- A further 2022 study, using UK Biobank data, concluded that a U-shaped relationship was observed between coffee intake and incidents of arrhythmia, suggesting that the lowest risk was observed at 2–3 cups per day<sup>11</sup>.



**Some studies have suggested a protective effect between coffee and AF<sup>26-28</sup>.**

## What are the potential mechanisms?

The potential mechanisms that may be behind the associations between coffee intake and health outcomes are an important aspect, and factors such as polyphenols and the effect of coffee drinking on circulating cholesterol may be important.

Research has suggested that coffee consumption may be associated with an increased antioxidant capacity of plasma and has also suggested a potential role for polyphenols, although a challenge is separating out the effect of caffeine, which itself has notable biological activity<sup>29,30</sup>.

In relation to cholesterol, the diterpenes in coffee, cafestol and, possibly kahweol are responsible for raising cholesterol levels, with the type of coffee brew being a big factor. For instance, consuming substantial amounts of Scandinavian boiled coffee, Cafetière (plunger pot), Greek and Turkish coffee is associated with raised S-TC levels. The effects on the cholesterol level are transient after the cessation of consumption<sup>22,31,32</sup>.

### **Latest research**

- A 2021 review considering potential mechanisms to explain the observed inverse relationship between coffee consumption and the risk of CVD studied the impact of coffee on inflammatory biomarkers<sup>33</sup>. The authors suggested that whilst boiled coffee was associated with raised total and LDL cholesterol and apolipoprotein B levels, no similar effect was observed for filtered coffee. They concluded that their review does not enable them to suggest that an anti-inflammatory effect of coffee is a major contributing factor in the lower all-cause mortality reported in observational studies<sup>33</sup>.

## Does genetics play a role?

Fascinating arms of research have considered the role genetics may play in habits and food choices. A review of inter-individual differences in caffeine metabolism suggested that the effects of caffeine are highly variable among individuals, due in part to a specific polymorphism involved in the metabolism of 95% of the caffeine ingested. Genetic studies have identified several loci

critically involved in caffeine consumption and its consequences on sleep, anxiety, and potentially in neurodegenerative and psychiatric diseases<sup>34</sup>. This research begins to show that a number of different biologic mechanisms may drive levels of caffeine consumption and its impact, although more research is needed.

### ***Latest research***

- A 2019 study investigated the contribution of gene polymorphisms together with regular caffeine intake to blood pressure, and the speed of calculation tests involving addition and multiplication procedures. The results suggested that overall caffeine intake independently increased blood pressure and calculation speed irrespective of any gene polymorphisms<sup>35</sup>. However, most studies have found a neutral or beneficial effect of coffee on hypertension<sup>18,19</sup>.



## **Summary**

The most recent research between the relationship of CVD and coffee consumption suggests that a moderate intake of coffee, of around 3–5 cups of coffee per day, is associated with a reduced risk of CVD mortality<sup>3,4,10,11</sup>. Further research considering specific aspects of cardiovascular health also suggests that coffee consumption is not associated with an increased risk of CVD, AF or hypertension, and in some cases, a moderate intake of coffee may offer protective effects<sup>15–20,27,28</sup>. Interestingly, coffee was included for the first time in the 2021 ESC Guidelines on CVD prevention in clinical practice<sup>23</sup>.



## About ISIC

The Institute for Scientific Information on Coffee (ISIC) is a not-for-profit organisation founded in 1990. ISIC is devoted to the study and disclosure of science related to coffee and health, including:

- **Study** of scientific matters related to coffee and health
- **Evaluation** of studies and scientific information about coffee and health
- **Support** of independent scientific research on coffee and health
- **Dissemination** of balanced coffee and health scientific evidence and knowledge to a broad range of stakeholders

ISIC respects scientific research ethics in all its activities. ISIC's communications are based on sound science and rely on scientific studies derived from peer-reviewed scientific journals and other publications.

ISIC members are six of the major European coffee companies: **illycaffè**, **Jacobs Douwe Egberts**, **Lavazza**, **Nestlé**, **Paulig**, and **Tchibo**.

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## About coffeeandhealth.org

For more information about ISIC and to view the latest research into coffee, caffeine and health, please visit our **new** website [www.coffeeandhealth.org](http://www.coffeeandhealth.org).

Follow us on twitter: [@coffeeandhealth](https://twitter.com/coffeeandhealth).



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