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The Effect of Caffeine in Healthy Humans

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Commentary

A Caffeine is the most well-known component of coffee, which is also found in many other beverages (tea, soft drinks, energy drinks), foodstuffs (cocoa, chocolate, guarana), athletic supplements, and even pharmaceuticals. Coffee has many different components, some of which are helpful to health (chlorogenic acids, polyphenols, diterpenes, micronutrients, melanoidins, fibre) and some of which are harmful (lipids in unfiltered coffee, or acrylamide arising from coffee bean roasting). The majority of the original studies gathered data on coffee or caffeine use in humans using dietary surveys or interviews. The recollection bias in these investigations is a limitation. Furthermore, caffeine concentration for most foods must be inferred from packaging, databases, scientific literature, or extrapolated from similar foods, however it has been measured directly from coffee or soft drink samples in some circumstances. Coffee is the largest source of caffeine consumption in Switzerland, with the majority drank early in the morning (6-9 a.m.), but some variances were noted among age groups, smoking status, and linguistic areas. Cultural differences in coffee/caffeine consumption are significant, and they may contribute to the health impacts reported in various geographic regions. Additionally, coffee/caffeine consumption may be influenced by expectation (placebo) effects and vice versa. The Caffeine Expectancy Questionnaire (CaffEQ), originally designed for the American population, was translated, adapted, and validated for the Brazilian culture (CaffEQ-BR), confirming that coffee is the main source of daily caffeine intake in Brazil, the world's largest coffee producer and exporter.

High-throughput investigations of the human genome, transcriptome, proteome, and metabolome have provided coffee researchers with a once-in-a-lifetime opportunity to enhance their study strategy while gaining mechanistic and causal insight into their observed connections. Human genetics and coffee and caffeine use were the subjects of three recent reviews and an original report. The results of genome-wide association studies (GWAS), which discovered several genetic variants related with habitual coffee and caffeine use as a review of Mendelian randomization (MR) research on coffee and caffeine consumption, fueled interest in this area. MR is a strategy that employs genetic variants as instrumental variables to determine if an observational connection between a risk factor (for example, coffee) and an outcome corresponds to a causal effect. The use of this approach to coffee and health is developing, but there are significant statistical and conceptual hurdles that should be considered when interpreting the results.

The role of genetics in caffeine-induced physiological reactions. Both stressed the current clinical interest in CYP1A2 and ADORA2A variants, implying chances to expand this research to other recent GWAS sites. Despite progress in incorporating genetics into caffeine clinical studies, such designs are still prone to limitations. Some of the limitations were underlined further in their critical analysis of the impact of caffeine expectations on sport, exercise, and cognitive performance. Interestingly, the original results of a randomised controlled experiment of ordinary coffee, decaffeinated coffee, and placebo revealed that coffee has stimulant activity beyond its caffeine concentration, raising concerns about the use of decaffeinated coffee as a placebo. The effect of coffee consumption on gene expression and the lipidome was examined. The findings of a population-based whole-blood gene expression analysis of coffee consumption revealed metabolic, immunological, and inflammatory pathways. Using data from a controlled trial of coffee consumption, researchers discovered that coffee consumption resulted in decreased levels of certain lysophosphatidylcholines. These two studies offer both fresh and confirming insights into the mechanisms by which coffee may affect health, and they further highlight the efficacy of high-throughput omic technologies in the nutrition sector [1-5].

Nonetheless, caffeine habituation through regular consumption of this substance may be a key modulator for obtaining caffeine ergogenicity. Caffeine administration of 6 mg/kg did not improve the time required to complete an 800 m competition in caffeine-addicted athletes while severely affecting sleep quality. Similarly, low-to-moderate caffeine doses (from 3 to 9 mg/kg) were found to be ergogenic in various settings with individuals who do not drink caffeine or are low caffeine consumers, but appeared ineffectual in boosting muscle performance in athletes used to caffeine consumption. These two studies suggest that moderate dosages of caffeine may not be ergogenic in caffeine-addicted individuals, most likely due to the gradual tolerance to the ergogenic action of this chemical when ingested consistently. High dosages of caffeine (up to 11 mg/kg) may have a good influence on maximal strength values in caffeine-addicted athletes, but may have a negative effect on muscle endurance while increasing the occurrence of caffeine-induced disadvantages. All of this evidence shows that athletes who consume caffeine on a regular basis should abstain from it for several days in order to remove/reduce tolerance to the ergogenic impact of this substance. Caffeine dishabituation is advocated instead of employing dosages of caffeine higher than the daily habitual consumption for athletes habituated to caffeine who seek caffeine's ergogenicity.

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