Caffeine Courses Through History

Caffeine has been used throughout time and has played an important role in shaping civilisation. Also known as 1,3,7-Trimethylpurine-2,6-dione, caffeine is chemically related to adenine and guanine bases of DNA and RNA.

An ancient Chinese legend says the Emperor Shen Nung first discovered tea when the wind blew leaves into his boiling water. An excavated mausoleum from the Han Dynasty lends physical evidence to the fact that tea was being consumed at least as early as 141 BC.

Coffee, on the other hand, has its own legends from native tribes of the Ethiopian Peninsula. A goat herder in the 9th century discovered his goats would not sleep after consuming the berries of a certain plant. He concocted a drink from the berries and stayed alert through long hours of prayer. These coffee berries were eventually transported to Arabia in the 15th century where they are still cultivated today. Even the Americas had their version of a caffeinated drink made from cacao by the Olmecs of Mexico.

Caffeine is a psychoactive drug – which means it can pass the blood-brain barrier and affect your brain directly. Brain cells have two special receptor proteins that are affected by caffeine, known as A1 and A2A. The adenosine binds to both receptors, promoting sleepiness and muscle relaxation, and interfering with the release of dopamine – a mood-improving neurotransmitter. Caffeine's structure is very similar to that of adenosine, and it fits into both receptors' active sites. When it binds, it blocks adenosine from transmitting its signal, staving off sleepiness, fatigue and even bad moods! One can certainly appreciate how using caffeine to enhance alertness while working with machinery and other equipment is positive and how briskly accomplishing tasks helps us all.

As a nutrition and food safety research institute we advance caffeine science on both exposures and related safety outcomes. Our Caffeine Committee has supported research to extensively evaluate safe thresholds for caffeine intake. A rigorous systematic review of over two dozen endpoints across five adverse health outcomes confirmed that the following consumption levels are not associated with overt, adverse health effects:

- ≤400 milligrams/day in adults (about four cups of coffee per day)
- ≤300 mg/day in pregnant women
- ≤2.5 mg/kilogram-body weight per day in children and adolescents.

While previous estimates of beverage caffeine consumption in the United States indicate 90 percent of caffeine consumers drink less than the equivalent of four cups of a caffeinated beverage per day, it is worth maintaining a current understanding of caffeinated beverage consumption. This becomes even more important as new caffeinated beverages have hit the market and remote work, e-commerce and food delivery contribute to potential changes in consumer behaviour and caffeine consumption patterns.

The Institute for the Advancement of Food and Nutrition Sciences (IAFNS) has brought together the academic, industry and government sectors to launch an analysis (see bit.ly/3ts8eGf) of beverage caffeine intakes that will evaluate current consumption patterns of the US population. These findings will enable comparisons of beverage caffeine intake with established guidance on caffeine – the crux of understanding the impacts of exposure.

New tools to capture consumer consumption behaviors will be used to evaluate current intakes of caffeine from beverages. In this way, we can learn more about the impact of caffeinated beverages on public health, which will be relevant to businesses throughout the tea and coffee arena.

In addition, the US Army Medical Research and Development Command and Henry M Jackson Foundation for the Advancement of Military Medicine are investigating how caffeine can be used to mitigate cognitive impairment due to limited sleep.

A new open access tool called 2B-Alert Web 2.0 (see pubmed.ncbi.nlm.nih.gov/35084336) can be used to automatically recommend safe and effective caffeine interventions – including both dose and timing – to achieve optimal alertness levels at specific times when the user is experiencing insufficient sleep. These types of tools may begin to help us plan safe but effective doses through time to achieve the mission or task at hand.

Using science to understand and gauge caffeine and its impacts on health will continue to serve the public, the military and other key stakeholders. And it may even power the next economic transformation.

To learn more details about the IAFNS beverage caffeine intake study or to join as a member, visit: iafns.org or email science@iafns.org.

Dr Wendelyn Jones is executive director (CEO) of the Institute for the Advancement of Food and Nutrition Sciences (IAFNS). She has a passion for bringing together science and society, drawing from her global experiences working across chemical, agricultural, food and health sectors. She applies her PhD in life sciences to extend IAFNS' contribution to, and impact within, diverse scientific and health communities.