Dynamic Chiropractic

HERBS/ TEAS & HOMEOPATHY

Caffeine and Diuresis

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We have learned that caffeine ingested in doses under 500 mg during exercise does not cause dehydration, and there is ample evidence to prove it.[1] But what about the scholarly support of caffeine as a diuretic? That also is not as solid as most people think. But if caffeine does cause diuresis and thus a negative fluid balance, this is important for those who treat musculoskeletal conditions. Why? Because a hydrated cell is an anabolic cell, and whether a patient is injured during sports, work or transportation, any deficiency will retard healing, including fluid balance.

Caffeine's ability to cause diuresis has rarely been challenged since a paper published in 1928 first demonstrated it.[2] The paper was often cited and rarely challenged for decades, even though it only studied three patients. Recently, an excellent review article by L.E. Armstrong and colleagues at the University of Connecticut examined 15 studies (totaling 23 different protocols) that focused on caffeine's effect on fluid balance.[3] All of the studies selected included water or placebo beverage compared to a caffeinated drink. The caffeine dosage ranged from 45 mg to 642 mg, and nine of these studies were four hours or less. The others were six, 16, 24, 24 and 72 hours, respectively, along with one 13-day study that I reviewed in detail last month.[1] Eight of the studies were at rest, seven included exercise, and one compared the effects of caffeine at rest to the effects of caffeine with exercise.[4] In the results, six of the 23 protocols showed that caffeine caused significant diuresis (see Table 1). The other 17 protocols did not find a diuretic effect (see Table 2).

Table 1 - Diuretic Effect	
Caffeine (mg)	Length of Study
642	24 hours
586	4 hours
360	4 hours
250	3 hours
250	3 hours
240	6 hours

Table 2 - No Diuretic Effect	
Caffeine (mg)	Length of Study
586	4 hours**
553	1 hour

452	16 hours
452	11 hours
300	4 hours
300	3 hours
300	3 hours
274	2 hours
253	24 hours
245	4 hours
226	16 hours
226	11 hours
150	4 hours
150	3 hours
150	3 hours
114	24 hours
90	4 hours
45	4 hours

The findings were as follows:

- None of the seven exercise trials caused diuresis.
- Six of 16 at-rest trials showed caffeine had a diuretic effect.
- Ten of 16 at-rest trials showed caffeine did not have diuretic effect.
- One study measured caffeine during both rest and exercise. In the study, 586 mg caused diuresis at rest, but not during exercise.[3]
- Most protocols measure the amount of urine produced following ingestion of caffeinated fluids versus noncaffeinated fluids over a given post-consumption time period.
- Twelve studies compared total ingested fluids to total excreted fluids over time to determine overall fluid balance instead of just fluid loss.[3]
- Three of 12 studies showed a negative fluid balance (more excreted than ingested over the period of the test) when either caffeine or the control beverage was ingested. Those studies were three hours in length and the losses were slightly higher with caffeine. The other nine trials displayed a net fluid gain.
- Five of nine net-gain studies showed caffeinated beverages had slightly greater fluid increases than noncaffeinated beverages.
- Three of nine studies yielded slightly lower fluid retention with caffeinated drinks compared to controls.
- One of nine studies showed a large difference between treatments. In that case, much more fluid was retained with the control (caffeine-free) drink.

Conclusion

It is apparent that the generally accepted view that caffeine is a diuretic and/or causes dehydration is

incorrect. There is no question that population responses to caffeine will not be uniform and diuresis will occur in selected individuals. However, there is not a substantial difference for the general population between caffeinated and noncaffeinated beverages regarding fluid balance. For those worrying about dehydration on a hot day, caffeinated fluids are clearly superior to no fluids. Armstrong, et al., summarized their work as follows:

"There is no evidence to suggest that moderate caffeine intake (less than 456 mg) induces chronic dehydration or negatively affects exercise performance, temperature regulation, and a circulatory strain in the hot environment. Caffeinated fluids contribute to the daily human water requirement in a manner similar to pure water ... The evidence indicates that consuming a moderate level of caffeine results in a mild increase in urine production ... This dieresis may or may not be significantly greater than a control fluid."[3]

References

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