

# STRAIGHT TOX

## Alcohol + Caffeine = Risky Behaviors (Another Chicken or Egg Dilemma?)

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*"Only Irish coffee provides in a single glass all four food groups: alcohol, caffeine, sugar, and fat." ...Alex Levine*

Lacking only the fat, the new "Irish coffee" appears to be the combination of energy drinks and alcohol. The most well-known of these is probably the "Jager Bomb", a concoction composed of Red Bull® energy drink with a shot glass of Jagermeister® dropped into it.

The popularity of these ersatz energy drink/alcohol combinations spawned yet a new entity: the caffeinated alcoholic beverage (CAB), some of which was being sold in a 24 oz can, containing 11-12 % alcohol by volume, with names like Four Loko®, Moonshot®, Joose®, and Max®.

This new ready-to-drink beverage has not escaped the scrutiny of the FDA. In November 2010, the FDA issued a warning to producers of the CAB drink, Four Loko®, and other similar products, that these products were being marketed in violation of the Federal Food, Drug, and Cosmetic Act (FFDCA). In that "the FDA has not approved the use of caffeine in alcoholic beverages at any level, and based on the information FDA has reviewed, the agency does not consider the use of caffeine in the beverages... to be generally recognized as safe (GRAS)."

Of particular concern was "published peer-reviewed studies suggest that the consumption of beverages containing added caffeine and alcohol is associated with risky behaviors that may lead to hazardous and life-threatening situations."

I agree with this assessment, but as physician/writer, Ben Goldacre often says, "It's a bit more complicated than that." The interplay of alcohol, caffeine and the hubris of youth presents an intriguing intersection of pharmacology, psychology, pop culture, peer pressure, and marketing.



## Pharmacology

Let's begin in our own backyard, the pharmacology. Alcohol mixed with energy drinks, is abbreviated "AmED" in some papers, thus we will use that abbreviation as well. AmED's differ mainly from CAB's in that AmED's are concocted by a bartender or consumer and CAB's are mass-produced already containing both caffeine and alcohol. Of course the FDA has little control over the former, after all we have been consuming liquor and caffeinated cola drinks since time immemorial. Recently however, there have been several interesting studies on the subject of alcohol and caffeine mixtures, a few of which are listed below. All are worth taking time the time to read, but the take-home points of these studies tend to be:

- Caffeine decreases the perception of intoxication, but does not improve performance.
- Caffeine tends to counteract slowing of response time in divided attention tasks.
- Caffeine does not prevent loss of accuracy in divided attention tasks.
- Energy drink ingredients give the consumer a greater false sense of physical and mental competence and decrease the awareness of impairment.

Other more well-known pharmacological factors that should also be considered are:

- Carbonation tends to increase gastric emptying and ethanol absorption rate.
- Diluted ethanol is more rapidly emptied from the stomach than are high concentrations of ethanol.

While the above points are decidedly pharmacological in nature, others may not be so clear cut. Some of these findings are:

- Those consuming AmED's in real-life situations drank longer, consumed more ethanol and had higher breath alcohol concentrations than those consuming ethanol or energy drinks alone.
- Consuming AmED's in real-life situations is associated with a 3-fold increase in the odds of leaving a bar with  $\geq 0.08$  g/dL breath alcohol concentration equivalent.
- Consuming AmED's in real-life situations is associated with a 4-fold increase in intent to drive after leaving a bar.



While these effects could certainly have a pharmacological component, perhaps due to altered self-assessment of impairment, one tends to wonder how other factors come into play.

One study found that AmED's are highly associated with "jock identity", masculinity and risk-taking behavior. This gives rise to the possibility that at least part of the behavioral component of prolonged drinking, with resulting higher breath alcohol concentrations, may be that the groups that are attracted by energy drink marketing, i.e. jocks, young males, etc., are disproportionately represented in the studied population in these real-life studies. In other words, how much of these risky drinking tendencies are cause and how much are effect?

### **Marketing**

Energy drinks are typically marketed to male teens and twenty-somethings, playing up to testosterone-rich masculinity and implying improved athletic performance and endurance. Studies indicate that men reported more frequent consumption of energy drinks than did women. The marketing tends to embrace risk-taking behavior with the sponsorship of extreme sporting events such as bridge jumping, base diving, etc. Even the names of many of these products invoke masculinity, bravado, sexuality, taboo, performance, endurance, and stimulation. Among the brand names are: Red Bull, Monster, Amp, Full Throttle, No Fear, Cocaine, Crunk, Adrenaline Rush, Rockstar, Liquid Ice, Jolt Blue, Meltdown, Molotov Explosive Energy, 5 Hour Energy, Hype, Energy, Reload, Battery, Bawls, Blue Charge, Blue Energy, Go Fast, Burn, Hustler, NOS, Mad Dog, Redline, Relentless, and Wired, all registered trademarks. And the list goes on.

Yet another marketing issue involves CAB's. Perhaps the most well-known of these, due to media coverage, is Four Loko®. Although now off the market, in at least it's caffeinated form, Four Loko® was 11-12% alcohol by volume; 2 to 3 times the alcohol concentration of beer, and was sold in 24 ounce cans; twice the size of the common 12 ounce beer. So let's do the math: One can of Four Loko® contained the alcohol equivalent of approximately 4-6 beers. A virtual six-pack in a can, you might say.

### **Pop Culture**

AmED's have been made popular in the mainstream by television shows such as Jersey Shore. Where perhaps the character most associated with machismo and masculinity, "the Situation", known for displaying his abs, is often seen ordering and consuming

Jager bombs, which he pronounces yaga-bwomb, in a thick Jersey accent. This show alone has probably introduced the drink to an untold number of American youth.

### **Psychology**

The concept of possible confounding variables was not lost on AmED researchers. One study investigated the role of expectancy on the impairing effects of alcohol. In the study, researchers led subjects to expect that caffeine would counteract the impairing effects of alcohol. Ironically, those subjects so prompted, displayed much greater impairment on a psychomotor task as compared with subjects who held no such expectation. This in itself is a frightening finding when applied to an often alcohol-naïve, risk-taking, highly-suggestible population such as teen and college-age drinkers.

Other studies point out possible population biases, observing that, "...on premise consumption of energy drinks mixed with alcohol may be a marker for difficulties in psycho-social development" and "...patrons who consume drinks mixed with energy drinks may have somewhat distinct behavioral or psychological characteristics, and it tends to weaken pharmacological explanations for the observed associations." Yet another study remarks: "...the relationships between consumption of AmED, high-risk drinking and alcohol-related consequences may be the result of selection effects; specifically, sensation-seeking individuals may be drawn to energy drinks, heavy alcohol consumption, and risky behaviors."

### **Other factors**

One cannot dismiss the fact that the addition of alcohol to energy drinks tends to make alcohol more palatable to novice drinkers, likely resulting in increased alcohol intake. Furthermore, the availability of products like Four Loko® in increased alcohol concentration and large servings adds to both the availability of alcohol and perhaps to a typically masculine peer pressure to finish an entire serving of the product or else be considered a lesser member of the peer group.

### **Summary**

Whatever the causes, CAB's and AmED's are associated with risky drinking behaviors often resulting in intoxicated driving. This has merited the attention of the FDA and should be of concern to social scientists and forensic toxicologists as well.

## References and Further Reading

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