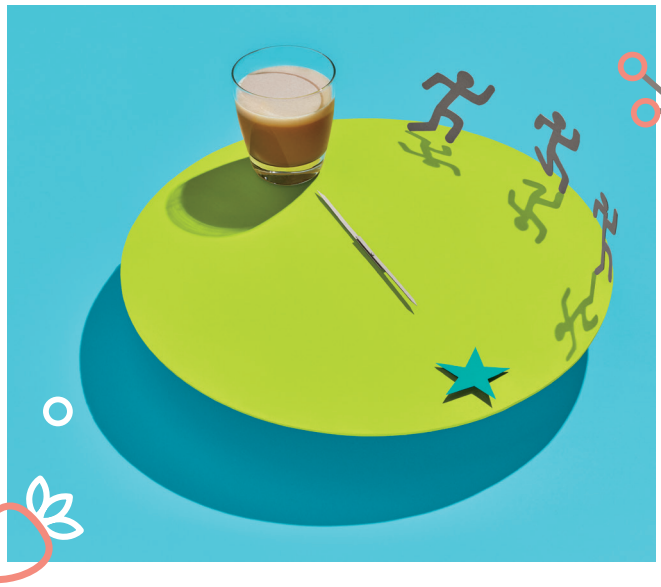
n-dur xr™ caffeine controlled release drink technology

extended release of caffeine in powdered beverages for up to six hours*

the value of extended release

Conventional caffeinated beverages typically achieve efficacy by delivering a high, initial single load of caffeine. This approach can result in undesirable side effects such jitters or headaches and fast "crash". In addition, a repeated dosing strategy to correct for the "crash" can result in the inability to fall asleep at night.

As an alternative, extended release delivery maintains optimal caffeine levels in the body. This approach can help provide a more desirable and beneficial physiological response. Extended release in a powdered beverage form also provides the consumer a delivery format (i.e. beverage) which is more interesting than a tablet and powdered form can be more convenient than an RTD format.



n-dur xr™ in application with caffeine from green coffee beans

Ashland's caffeine powder made with extended release N-Dur XR™ technology is a naturally sourced caffeine from green coffee beans. Natural caffeine has been described as having a smoother and more beneficial physiological effect. In comparison, many other sources on the market are made from synthetic caffeine, which is more frequently associated with jitters and headaches.

key features and benefits

- extends caffeine release up to 6 hours
- microencapsulated caffeine, 70% concentration
- helps mask unpleasant bitter taste
- allows for lower dosing
- efficacious while minimizing negative side effects
- natural caffeine from green coffee beans
- easy-to-use powder form
- enhanced dispersibility
- suitable for whey and fruit-based formulations
- cGMP compliant
- vegan
- kosher and halal certifications available

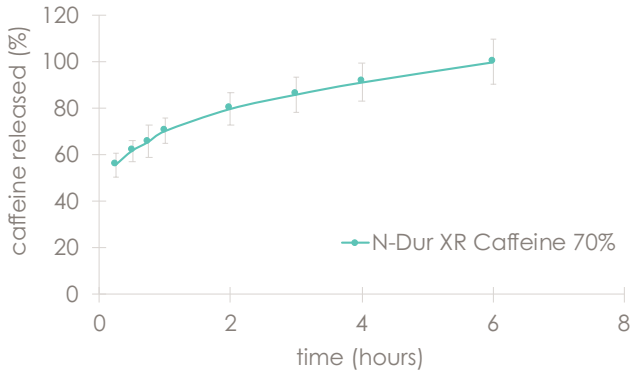
technology description

N-Dur XR™ drink technology uses a proprietary, patent-pending process and specialty ingredients to provide an extended release delivery system that can be formulated into shakes and powdered beverages. The extended release mechanism is robust and designed to release the caffeine only after dispersion. Dissolution profiles demonstrate the caffeine will release for up to 6 hours. (Figure 1) In addition, the N-Dur™ technology process helps mask bitter notes from the caffeine.

suitable application include:

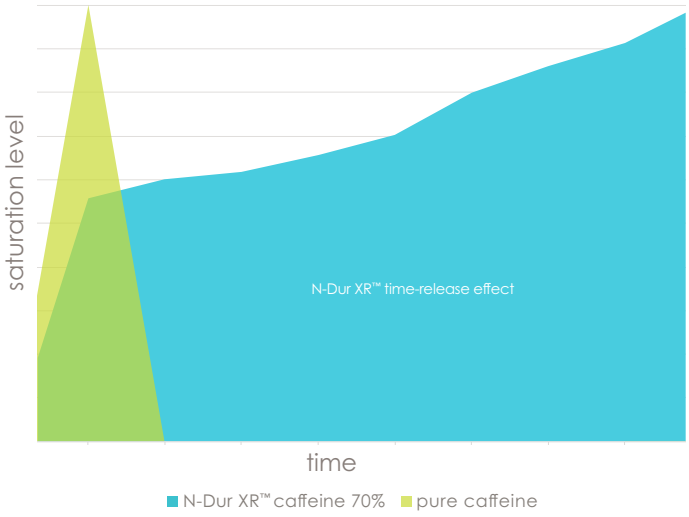
- dry powder beverages
- sachets
- stick packs
- cannisters

figure 1 – dissolution profile



Dissolution profile of Natural caffeine with N-Dur XR™ technology tracking Caffeine, for 6hr using DI water and tested in a USP Apparatus 1 (basket).

figure 2 – relative release profile



Conventional caffeine reaches 100% saturation immediately, which can lead to headaches, jitters and post-caffeine "crash." The extended release of N-Dur XR™ caffeine provides an immediate energy boost and continues to release for up to 6 hours. This minimizes potential side effects and provides consistent energy.

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