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Even small amounts of highly concentrated caffeine powder can cause severe poisoning Accidental overdose is easily possible

Caffeinated powders offered as food supplements are freely available to buy locally or online. Such products are used, for example, by some athletes as so-called "*pre-workout*" products to enhance performance. In particular, pure or highly concentrated caffeine powders are also available in some online shops. According to the German Federal Institute for Risk Assessment (BfR), these products may carry a high risk of accidental overdose, and even very small amounts may cause significant health impairment.

The European Food Safety Authority (EFSA) recommends that healthy non-pregnant adults should not consume more than 0.2 grams (g) of caffeine as a single dose. A total amount of 0.4 g, consumed throughout the day, is considered by EFSA as not giving rise to safety concern; for pregnant and breastfeeding women the total amount consumed throughout the day without safety concern is 0.2 g.

In the case of pure caffeine powder, the amount of powder is equal to the amount of caffeine: 0.2 g of powder therefore contain 0.2 g of caffeine. This roughly corresponds to a pinch of powder. Such a small amount cannot be measured precisely with conventional kitchen scales or a measuring spoon.

In addition, consumers tend to underestimate the effects of highly concentrated caffeine powder, as they cannot be compared to the effects of an equal amount of coffee powder or another caffeinated food.

Small doses of caffeine can have positive effects and increase alertness and performance. However, too much caffeine can cause severe restlessness, nausea, increased blood pressure, tachycardia and cardiac arrhythmia. Ingesting about 5 to 10 g (roughly one to two teaspoons) of pure caffeine is life-threatening. Severe or even fatal poisoning from highly concentrated caffeine powders is rare, but has been described as individual case reports in the scientific literature.

The effect of caffeine on the body varies from person to person and depends, among other things, on individual sensitivity and habituation to the substance. Excessive coffee consumption can lead to unwanted effects such as restlessness, tremors or tachycardia – however, caffeine poisoning is not to be expected in healthy adults with normal coffee consumption. The potentially fatal dose of caffeine for an adult is considered to be around 5 to 10 g.

A cup of coffee (200 millilitres) contains about 0.09 g of caffeine. To consume 5 g of caffeine in the form of coffee, a person would have to drink about ten litres of coffee. In the case of highly concentrated or pure caffeine powders, just one to two teaspoons of powder already contain about 5 to 10 g of caffeine – the potentially fatal dose.

The recommended dosage is usually indicated on the powder products sold (e.g. 0.2 g as a single dose), but conventional kitchen scales are not designed to weigh such small amounts. They usually only measure relatively accurately from 1 g. Even if measuring spoons are provided, the measuring process is very inaccurate. In addition, while most consumers know how they react to coffee, many people are unaware that the same amount of pure caffeine has a much stronger effect. This means that extremely high doses of caffeine may be accidentally ingested when consuming the highly concentrated powder products available on the market.

In Germany, rare cases of severe acute caffeine poisoning have been described. A young woman who, without knowing the recommended dosage, accidentally took two teaspoons of highly concentrated caffeine powder – about 9 g – died despite intensive medical treatment. Similar cases have also been described in other countries.

Caffeine powders that are offered as food supplements are considered as food and are available over the counter. These products do not undergo an authorisation procedure and are not tested by the authorities for safety or efficacy before they are placed on the market. According to the Regulation on Food Supplements (NemV), the products must, among other things, contain information on the recommended daily dose and a warning that this amount must not be exceeded. Manufacturers and distributors are responsible for the safety of the products and compliance with food law. The food control authorities of the German federal states ("Laender") are responsible for monitoring products on the market.

Further information:

G. Wellershoff: Schwere akzidentelle Intoxikation durch Koffeinextrakt. Notarzt 2018, 34, 85-89, DOI: 10.1055/s-0044-100718

S. Anthonsen: Kreislauf- und Lungenversagen nach primär überlebter Koffein-Intoxikation. Anästhesiologie & Intensivmedizin, 2018, 59, 32-37, DOI: 10.19224/ai2018.032

Further information on food supplements

Frequently asked questions on caffeine and foods containing caffeine, including energy drinks

<https://www.bfr.bund.de/cm/349/frequently-asked-questions-on-caffeine-and-foods-containing-caffeine-including-energy-drinks.pdf>

Frequently asked questions on food supplements

<https://www.bfr.bund.de/cm/349/frequently-asked-questions-on-food-supplements.pdf>

About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent institution within the portfolio of the Federal Ministry of Food and Agriculture (BMEL) in Germany. The BfR advises the Federal Government and the States ('Laender') on questions of food, chemicals and product safety. The BfR conducts independent research on topics that are closely linked to its assessment tasks.

About mikroco.info

The internet portal www.mikroco.info provides information on vitamins, minerals and numerous other substances that we ingest with food or that are offered as food supplements. In addition, the individual pages contain the maximum levels of vitamins and minerals in food supplements and in fortified foods as recommended by the German Federal Institute for Risk Assessment (BfR).



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Publisher:

German Federal Institute for Risk Assessment

Max-Dohrn-Straße 8-10

10589 Berlin, Germany

T +49 30 18412-0

F +49 30 18412-99099

bfr@bfr.bund.de

bfr.bund.de/en

Institution under public law

Represented by the president Professor Dr Dr Dr h.c. Andreas Hensel

Supervisory Authority: Federal Ministry of Food and Agriculture

VAT ID No. DE 165 893 448

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