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Dark Chocolates, Cocoa & Cacao Powders, Nibs, and Supplements Review -- Sources of Flavanols

Is Your Chocolate or Cocoa Healthful or Toxic? Find the Best Dark Chocolate, Cocoa Powder and Cocoa Supplements Based On Our Tests.

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Updated June 23, 2025 ⓘ

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Summary

- **What are the health benefits of dark chocolate and cocoa?** Cocoa-based products contain flavanols, which are associated with modest, potential benefits regarding blood flow, blood pressure, cholesterol levels, exercise, skin wrinkles, and blood sugar control. Memory and cognitive benefits appear to be very limited (see "What It Does").

- **How much cocoa or dark chocolate do I need?** This depends on two things: The amounts of cocoa flavanols used in various clinical studies (summarized below), and the actual amounts of flavanols that we found in a serving of each product, which is provided in the 2nd column in the Results Table.
  - Cardiovascular health: About 200 to 900 mg per day
  - Blood sugar/insulin improvement: About 200 mg to 600 mg per day
  - Memory/cognitive function: About 500 to 900 mg per day
  - Skin elasticity/wrinkles: 320 mg per day

- **Which dark chocolate and cocoa products are best?** *Be careful!* Several cocoa powders, cacao nibs, and some dark chocolates failed to pass our review due to contamination with *high levels of cadmium, a toxic heavy metal* (see What CL Found and How Products Were Evaluated). Furthermore, levels of potentially beneficial cocoa flavanols ranged from just 1 mg to 374 mg in cocoa powders and mixes, 2 mg to 351 mg in dark chocolates, and 2 mg to 993 mg in supplements. Products also vary widely in calories per serving.

  Among products that minimize heavy metal exposure, maximize flavanol content, and offer superior value without sacrificing flavor, we selected our ***Top Picks among supplements, cocoas and mixes, dark chocolates and chips, and cacao nibs***.

- **Are dark chocolate and cocoa safe?** Although cocoa and dark chocolate products are generally safe, it may be best to limit consumption of products due to contaminants as well as calories (see How much of a danger is cadmium from cocoa and

chocolate?). Although it is common for cocoa beans to be contaminated with the fungal toxin ochratoxin A (OTA), most of the toxin is found in the *shell* of the bean, which is removed during processing. Levels of OTA in processed cocoa products, such as cocoa powder and chocolate, have generally been found to be quite low and not of concern. Be aware that the caffeine and theobromine in cocoa products may cause side effects as well as interfere with the actions of certain drugs. Cocoa and dark chocolate products may also trigger migraine headache in some people as well as eczema or allergic contact dermatitis in nickel-sensitive individuals. People with milk allergies should be aware that dark chocolate bars may contain milk (see Concerns and Cautions).

Products tested in 2019 and 2022

Updates

Rodelle (2/21/23):

Concerned by the amounts of cadmium CL found in cocoa powders in this Review, a CL member asked Rodelle — ADM Nutrition for the cadmium level in *Rodelle Gourmet Baking Cocoa*, a product that was not included in our tests. A Rodelle sales support representative responded with the following information, which the CL member sent to us for interpretation — see our comments in brackets and italics below. Be aware that this cocoa is "Dutch Processed;" consequently, it will likely be low in potentially beneficial cocoa flavanols.

> *"ADM's Rodelle performs a monitoring program on heavy metals and pesticide residue related to raw material and finished product. This program includes a risk assessment on raw materials, country of origin, GFSI compliance, regulatory history, and a suppliers' performance history, COA, and attestation to applicable pharmacopeia limits. Where heavy metal and pesticide risks are identified, the method of detection, monitoring, and testing frequency will be determined and performed by our facility. Our products conform to the EPA regulations for pesticide residues. We are a tin-free facility.*
>
> *We adhere to the following limits and applicable regulations relating to heavy metals and attest that our product falls within the following specifications:*
>
> ***< 0.960 ppm cadmium*** [*THIS IS A VERY LENIENT LIMIT. A 1-tablespoon serving (listed as 6g on the package) could contain as much as 5.76 mcg of cadmium, exceeding California's Prop 65 level of 4.1 mcg, requiring a warning label in that state. The vast majority of cocoa powders tested by CL have been below this limit, with some at just 1/10th of this limit. Rodelle's limit is also higher than the 0.6 ppm limit in the European Union.*]
>
> ***< 0.225 ppm lead*** [*THIS IS A LENIENT LIMIT. A tablespoon of this product could contain as much as 1.35 mcg of lead, while the majority of cocoa powders tested by CL have less than half this limit.*]
>
> ***< 1 ppm arsenic*** [*THIS IS A LENIENT LIMIT. We found that all cocoa products had less than 10% of this limit.*]
>
> ***< 1 ppm mercury*** [*Mercury is not a known problem in cocoa, but this seems to be a LENIENT LIMIT considering that consumers are advised by the U.S. EPA to "avoid consumption" of fish containing more than 0.46 ppm of mercury — half of Rodelle's limit — although servings of fish are typically about 10 times greater than that of cocoa.*]

In short, Rodelle seems to have chosen lenient limits for heavy metal contamination. If its cocoa powder fell just within its allowed limits, it would fail our review, but we have not tested this product.

What It Is:

Cocoa powder (also called cocoa solids) is made from cacao beans after removal of the natural fats (cocoa butter). Cocoa powder is rich in antioxidant compounds known as flavanols that also occur in grapes, apples, and teas. Flavanols can exist as simple compounds (catechins monomers) or linked together (catechins oligomers or polymers) as compounds known as proanthocyanidins or PACs. (Note: Flavanols differ from flavonols, such as quercetin, which contain a ketone group.)

Cocoa powder is used to make cocoa beverages, chocolate, chocolate syrup and chocolate confectionaries. The amount of flavanols in a cocoa-based product depends on multiple factors including plant genetics, where the plant is grown, how the plant is harvested, how the cocoa is processed, and how the product is prepared. For example, dark chocolate and milk chocolate are made with cocoa powder and cocoa butter, however, dark chocolate has a much higher concentration of flavanols because milk chocolate includes milk, and, typically, a larger amount of sugar.

Be aware that the "% cocoa" or "% cacao" in a chocolate reflects the total amount of cocoa powder plus cocoa butter relative to all other ingredients. As sugar is the only other ingredient in dark chocolate, "% cocoa" in dark chocolate tells you the percent that is not sugar. However, as manufacturers typically don't disclose the ratio of cocoa powder to cocoa butter in their chocolates, the "% cocoa" is only a rough indicator of how much cocoa powder is in a product and how flavanol-rich the chocolate may be. Also be aware that the FDA has found milk in some dark chocolates — see Concerns and Cautions.

What It Does:

Cardiovascular effects

Populations that consume higher amounts of flavanols from cocoa and other sources tend to have lower rates of cardiovascular disease, and one long-term trial suggests that cocoa flavanol supplementation reduces the risk of cardiovascular death. Other clinical studies have shown that the consumption of cocoa flavanols can modestly improve vascular function and have favorable effects on cholesterol levels, but long-term blood pressure lowering has not been demonstrated in people with hypertension and the effects on cholesterol have only been demonstrated in short-term studies of healthy individuals. Cocoa flavanols may have a useful, short-term benefit in people with peripheral artery disease.

In January, 2023, the U.S. FDA indicated that it would allow very high-flavanol cocoa powder to make the following, or similar, health claim: "Very limited scientific evidence suggests that consuming cocoa flavanols in high flavanol cocoa powder, which contains at least 4% of naturally conserved cocoa flavanols, may reduce the risk of cardiovascular disease." Interestingly, in its decision, the FDA rejected a similar claim for dark chocolate, due to a lack of evidence. It should be noted, however, that most cocoa powders do not provide a "4%" concentration of cocoa flavanols (200 mg per 5 grams or 1 tablespoon). For example, ConsumerLab found 10 to 125 mg per 5 grams in the cocoa powders in this Review. The request for the claim was submitted by the company, Barry Callebaut, that produces a proprietary cocoa powder, Acticoa (which has been used in clinical studies), that provides unusually high levels of flavanols — which it attributes to special processes that help preserve flavanols during cocoa production. Currently, Acticoa only seems to be sold in bulk.

In 2012 the European Food Safety Authority (responding to a request from the company Barry Callebaut) granted permission for a claim to be made on product labels stating that, "Cocoa flavanols help maintain endothelium-dependent vasodilation, which contributes to normal blood flow." In order to obtain the claimed effect, 200 mg of cocoa flavanols should be consumed daily. This amount could be provided by 2.5 g of high-flavanol cocoa powder or 10 g of high-flavanol dark chocolate, both of which can be consumed in the context of a balanced diet (EFSA 2012). [You can check the amounts of flavanols found by ConsumerLab.com in various products in Results table below.]

Lower risk of death:

In one of the largest and longest clinical studies to date, the Cocoa Supplement and Multivitamin Outcomes Study (COSMOS), cocoa flavanol supplementation was shown to **reduce the risk of death from cardiovascular disease.** The study, among 21,442 men and women (average age 72) without a history of heart attack or stroke, found that those taking cocoa extract daily (providing 500 mg of

flavanols and 80 mg epicatechin) for an average of 3 ½ years had a 27% lower risk of cardiovascular death over the course of the study compared to placebo. Those taking cocoa also had somewhat lower rates of heart attacks, strokes, and death from any cause but each was not statistically significant compared to placebo. During the study, half of the participants also took a daily multivitamin (*Centrum Silver*), but this did not affect outcomes. The extract was provided by Mars Edge, which funded the study (Sesso, Am J Clin Nutr 2022).

Most other studies that suggest cardiovascular benefits have tended to be of short duration (up to 4 weeks).

Blood pressure and cholesterol:

A study among 100 *healthy*, middle-aged men and women, consuming a flavored drink twice daily (providing a total of 900 mg cocoa flavanols) for one month resulted in a small, but significant **improvement in blood vessel endothelial function** (which contributes to normal blood flow) compared to a placebo drink (which contained similar amounts of caffeine and theobromine, but no cocoa flavanols). Those who drank the cocoa flavanol drink also had small but significant reductions systolic and diastolic blood pressure (4.4 mmHg and 3.9 mmHg, respectively) and total and LDL "bad" cholesterol (approximately 8 mg/dL and 7 mg/dL, respectively), as well as a slight increase in HDL "good" cholesterol (about 4 mg/dL). The researchers reported that these changes reduced the estimated risk of death from cardiovascular disease over a projected 10-year period by 30% compared to those who consumed the placebo drink. The flavanol drink, a powder mixed with water and consumed with breakfast and dinner, was made with the same extraction process (called *CocoaPro*) as *CocoaVia* reviewed below and was provided by MARS Inc., which sponsored the study (Sansone, Br J Nutr 2015). Similar improvements in cholesterol levels were seen in a small study using a specially processed, high-flavanol cocoa powder. In the study, healthy men and women who consumed 4 grams of the powder (providing 220 mg of flavanols, including 92 mg of epicatechin) daily for one month had average decreases in blood levels of total cholesterol (-12 mg/dL), LDL cholesterol (-14.98 mg/dL), oxidized LDL (-95.61 U/L) and triglycerides (-3.8 mg/dL), and an average increase in "good" HDL of 3.37 mg/dL cholesterol compared to levels before supplementation. People who took one-half or one-quarter of the dose did not have significant changes in any of these measures. The study was funded by the maker of the cocoa, Casa Luker S.A. Company of Columbia, which claims to have developed a process allowing for less oxidation and damage to cocoa polyphenols than traditional roasting (Danvinelli, J Nutr Biochem 2018).

A study in young, sedentary, but otherwise healthy women in Texas found that daily consumption of 12.7 grams of a natural cocoa bar (containing 309.6 mg of flavanols, including 48 mg of epicatechin) for 4 weeks led to an 18% **increase in HDL ("good") cholesterol** and a 60% decrease in EMPs (particles associated with blood vessel damage). However, additional positive changes in blood markers were seen mainly with obese women and not women of normal weight, suggesting a more positive effect of cocoa on obese women than those who are not obese (McFarlin, J Nutri Biochem 2015).

A small study in Italy found that within 2 hours of consuming a bar (40 grams) of dark chocolate which was greater than 85% cocoa, people with **peripheral artery disease** (due to atherosclerosis) were able to **walk 15% further** than normally; eating a similar amount of milk chocolate had no effect (Loffredo, J Am Heart Ass 2014). A six-month study of 44 people with peripheral artery disease in Chicago who consumed, as a beverage, 5 grams of cocoa providing 25 mg of epicatechin, or a placebo, three times daily, also suggested improvement in walking distance, indicating the cocoa increased six-minute walking distance 2.5 hours after the final drink by 42.6 meters (about a 12% increase over baseline) compared to placebo after adjusting for differences between the groups. It must be noted, however, that much of this improvement was relative to a 15.3-meter decrease in the placebo group and other adjustments, as the actual increase in the cocoa-treated group was very little -- only 8 meters. There was no significant difference between the groups 24 hours after the final drink, suggesting, *no long-term benefit* on walking distance (McDermott, Circ Research 2020).

Unfortunately, among people with mild **hypertension**, cocoa has been of limited benefit. A placebo-controlled study in the U.S. among people with stage 1 hypertension (blood pressure of 140-159/90-99 mm Hg), failed to show reductions in blood pressure or other benefits from cocoa-based products except among those also taking ACE inhibitors or beta blockers — among whom blood pressure levels fell by roughly 2 to 5 mm Hg. However, blood pressure rose (by about 5 mm Hg) among those taking diuretics who consumed the cocoa-based products. The study (funded by Hershey) involved the daily consumption of 10 grams of extra dark chocolate (89 mg of flavanols) and a beverage containing 2.5 grams of cocoa powder (42 mg of flavanols), or twice the amount of each for 8 weeks. (Njike, Clin Trials Reg Sci Cardiol 2016). Similarly, a study in Finland among people ages 33 to 64 with mild hypertension found that eating dark

chocolate (49 grams daily -- 70% cocoa, providing 603 mg flavanols) for 8 weeks had no significant effect on blood pressure or other cardiovascular risk factors (such as arterial stiffness), compared to 8 weeks of refraining from chocolate. During both periods subject were told to reduce snacking — possibly explaining the loss of about 2 lbs. during the non-chocolate period of the study, although this did not affect blood pressure (Koli, Nutrition Journal, 2015).

In **people who do *not* have hypertension**, cocoa flavanols have little to no effect on blood pressure. A small study among 11 people with normal blood pressure (average systolic blood pressure 115 mmHg, average diastolic blood pressure 74 mmHg) showed that taking cocoa extract that provided a very large dose of cocoa flavanols (862 mg, including 160 mg of epicatechin), 40 mg of caffeine, and 150 mg of theobromine, slightly lowered 12-hour systolic and diastolic blood pressure, respectively, by just 1.4 mmHg and 0.5 mmHg compared to placebo, with largest decreases observed within the first 3 hours and then again at about 8 hours after supplementation. However, when analyzed by baseline blood pressure, the reductions in blood pressure were observed *only among those with pressures above approximately 115/75 mmHg* (Bapir, Front Nutr 2022).

Long-term studies in people with elevated cholesterol levels are needed to better assess the true benefit of cocoa flavanols on cholesterol.

Atrial fibrillation:

Higher consumption of chocolate has been associated with a lower risk of developing **atrial fibrillation (AF)**, which is the most common type of irregular heartbeat and, itself, is associated with higher risk of stroke, heart failure, cognitive decline, dementia, and mortality (death over time). A large, 13.5-year study in Denmark found that, compared to people who ate no chocolate, the risk of atrial fibrillation was 10%, 17%, and 20% lower among those who ate, respectively, one to three 1 oz. servings of chocolate per *month*, one serving per *week*, or two to six servings per *week* after adjusting for calorie intake and other variables. Unfortunately, the type of chocolate (dark or milk) was not specified; however, chocolate in Europe is required to have higher concentrations of cocoa than in the U.S: at least 30% for milk chocolate (vs. 10% in the U.S.) and 43% for dark chocolate (vs. 35% in the U.S.) (Mostofsky, Heart 2017).

A shorter (3.5-year) but very large study (the COSMOS trial – discussed above) found that cocoa extract (providing 500 mg of flavanols and 80 mg epicatechin) taken once daily did not result in a statistically significant reduction the risk of atrial fibrillation; however, follow-up for an additional two years after supplementation ended showed a 12% lower risk of developing atrial fibrillation over the full 5.5 year period among those who had taken the cocoa extract compared to those who did not take the extract, even after factoring for other risk factors such as age, high blood pressure, and diabetes (Middeldorp, Eur J Prev Cardiol 2024).

Heart failure:

A review of several studies found an association between moderate chocolate consumption (1 to 3 servings per month) and a 23% *lower* risk of **heart failure** compared to no regular chocolate consumption, although consumption of one or more servings per day was associated with a 17% *higher* risk of heart failure. These associations, however, were *not* deemed statistically significant and neither the form of chocolate nor serving size was specified (Krittanawong, Eur Heart J Supplement 2018).

Blood-thinning effects:

Cocoa flavanols appear to temporarily delay one measure of **platelet function** according to a small study of healthy young men who consumed 50 grams of a high-flavanol (90% cocoa) chocolate (Lindt). A 14% delay in a measure of clotting (collagen/ADP-induced closure time) occurred four hours after eating the chocolate, which coincided with the appearance of cocoa flavanols in the men's blood. The researchers concluded that dark chocolate may be beneficial for people at risk of **thrombosis (clot development)** (Montagnana, Medicine 2018). However, the researchers acknowledged that more study is needed, and a long-term (three-month) study involving high-dose cocoa flavanols did *not* find a significant effect on platelet function in healthy men and women (Ottaviani, Am J Clin Nutr 2015).

There is some evidence that cocoa or chocolate consumption may **enhance the effects of certain antiplatelet medications** in people with coronary artery disease. A small study in Trinidad among 20 men and women (average age 61) with coronary artery disease who were taking aspirin (81 mg per day) and the antiplatelet medication clopidogrel (Plavix) (75 mg per day) showed that consuming 30 grams of dark chocolate (65% cocoa solids and 35% sugar; flavanol concentrations not reported) daily (one 10-gram bar with each meal) for one week modestly increased the antiplatelet effects of clopidogrel (an 11.9% reduction in platelet reactivity) and, to a lesser degree, added to the effects of aspirin, compared to when no dark chocolate was consumed. There were no serious adverse effects associated with consuming dark chocolate (Seecheran, Open Heart 2022).

Some evidence suggests that cardiovascular effects of flavanols are due to modulation of nitric oxide concentrations and that these effects may be based on chemical properties other than the antioxidant properties of the ingested compounds.

Blood Sugar, Insulin Resistance, and Diabetes

Intake of moderate amounts (200 mg to up to 600 mg daily) of cocoa flavanols may decrease fasting blood sugar and improve insulin sensitivity, but a benefit has not been shown with higher amounts, and cocoa flavanols provide no such benefit to people with diabetes that is already well-controlled with medication. Cocoa flavanols also do not appear to reduce the risk of developing diabetes.

A review of 8 clinical trials among men and women (many of whom had conditions such as high cholesterol, high blood pressure, or diabetes) found that, compared to placebo, a daily cocoa flavanol intake between 200 mg and 600 mg significantly **decreased fasting blood sugar** levels (down 0.26 mmol/L), fasting insulin (down 2.43 uIU/mL) and HOMA-IR, a measure of insulin resistance (down 0.72 points). Higher daily intakes of cocoa flavanols (at or above 600 mg) resulted in a greater decrease in HOMA-IR (down 1.05 points), but had less of an effect of fasting insulin (down 2.10 uIU/mL) and *did not* significantly decrease fasting blood sugar levels (Lin, J Nutr 2016).

However, consuming a high-flavanol cocoa drink (providing 609 mg of cocoa flavanols including 95 mg of epicatechin) twice daily for four weeks did *not* improve **insulin sensitivity** compared to a low-flavanol cocoa drink (13 mg of cocoa flavanols including 2 mg epicatechin), nor compared to baseline, in a study among 32 overweight or obese premenopausal women (average age 34) with insulin resistance in the UK. In addition, there was no decrease in body weight with either beverage. Both cocoa beverages were provided by Mars, which funded the study (Simpson, Nutrients 2023).

Cocoa flavanols did *not* provide additional benefit to people with **diabetes and hypertension** *already controlled with medication*, as demonstrated in a 12-week, placebo-controlled study using 2.5 grams per day of flavanol-rich cocoa powder (ACTICOA, from Barry Callebaut) that contained a total of 207.5 mg of cocoa flavanols (Dicks, Nutrients 2018).

Despite evidence from observational research linking *moderate* intake of chocolate with a lower **risk of developing diabetes** among some postmenopausal women (Greenberg, Eur J Clin Nutr 2017), an analysis of data from a large clinical study in the U.S. involving 18,381 middle-aged adults without diabetes at baseline found that taking cocoa extract (containing 500 mg of cocoa flavanols, including 80 mg of epicatechin) daily for an average follow-up of 3.5 years did *not* significantly reduce the risk of developing type 2 diabetes compared to placebo (Li, Diabetes Care 2023).

A study of 14 healthy postmenopausal women found that they consumed an average of 100 **fewer calories** within 90 minutes after eating 85 grams (about two regular servings) of 80% dark chocolate than after eating similar amounts of white or milk chocolate. Blood glucose and insulin concentrations were also higher after consuming milk or white chocolate than after dark chocolate, suggesting greater blood sugar control with dark chocolate. Dark and milk chocolate (both of which contain cocoa solids) led to higher blood levels of pancreatic polypeptide (which may help reduce appetite), than white chocolate (which does not contain cocoa solids). These results suggest that, given a choice, dark chocolate may help postmenopausal women moderate overall energy intake better than milk and white chocolate (Marsh, Appetite 2017).

Interestingly, 67 postmenopausal women in Spain who consumed 10 grams of cocoa-rich chocolate ("99% cocoa," providing 65.4 mg of cocoa flavanols) once daily for 6 months lost about 1 lb of **body fat**, while a similar group of 61 women not given the chocolate gained nearly ½ lb on average, although there were no significant differences between the groups in terms of changes in overall weight or BMI, nor in serum insulin. The chocolate maker Lindt & Sprungli supplied the chocolate but was not involved in the study (Garcia-Yu, Br J Nutr 2020). (The same study found a slight improvement in two measures of cognitive function with chocolate, as discussed below.)

Exercise and physical performance

Although several small studies suggest cocoa flavanols may modestly improve physical performance in young and older adults, longer, high-quality studies are needed to prove a benefit.

In young adults:

A small study in moderately-trained young men given 40 grams of dark chocolate or white chocolate (which lacks flavanols) for 14 days found the dark chocolate resulted in a modest (17%) but statistically significant **increase in the distance they could cycle** in 2 minutes and reduced the oxygen cost of exercise, suggesting that it "may be an effective ergogenic aid for short-duration moderate intensity exercise." (Patel, J Int Soc Sport Nutr 2015). The benefit may be due to the ability of epicatechin flavanols to dilate blood vessels by modulating nitrous oxide production. Dove Dark Chocolate was used in the study on the researchers' belief that it had a high concentration of the flavanol epicatechin, but they did not test flavanol levels and it's likely that it actually has a low concentration relative to other products as indicated by other research (Kaspar, U. Wisc. 2006) and the fact that it is only 40% to 50% cocoa (according to Mars Chocolate customer care) and sugar is listed as its primary ingredient.

In older adults:

Consuming large amounts of cocoa powder may modestly **improve physical performance in daily activities** like walking, rising, and gripping objects. This was shown in a study among older men and women in Mexico (average age 76) which also showed the cocoa flavanols to reduce biochemical markers of oxidative stress associated with frailty. In the study, which lasted two months, every day before breakfast a group of participants consumed 5 grams of cocoa powder (with 6 grams of added sugar) mixed in water while another group had a placebo drink. Each serving of cocoa contained 179 mg of cocoa flavanols while the placebo was an alkalized cocoa beverage that did not contain flavonoids but contained the same amount of theobromine (Munguia, J Gerontol A Biol Sci Med Sci 2019). Cocoa flavanols also seemed to *slightly* improve exercise capacity and vascular function based on a cycling test in a small study among 68 healthy older people (average age 64) in Germany who consumed 500 mg of high-flavanol cocoa extract (standardized to 80 mg of epicatechin) twice daily for 30 days. Systolic and diastolic blood pressure were also slightly reduced. *However*, these improvements were in comparison only to baseline and not to changes among people who receive a placebo, so it is unknown if the cocoa flavanols provided any meaningful benefit. Mars, Inc., USA donated the cocoa flavanol extract and placebo used in the study but did not appear to be involved in conducting or funding the study (Gröne, Food Funct 2023).

Memory and cognition

The largest and longest trials have not found a long-term cognitive benefit from cocoa flavanols in cognitively healthy older adults or those who developed mild cognitive impairment or dementia. High-dose cocoa flavanols may provide some limited, short-term benefits when taken before cognitively demanding tasks, although not all research agrees.

Long-term effects:

One of the largest and longest trials to date, which analyzed 1,773 generally cognitive healthy older men and women (average age 73) who took a cocoa extract (providing 500 mg of flavanols and 80 mg epicatechin) daily for three years (as part of the larger COSMOS trial) found no improvement in cognition compared to placebo (Baker, Alzheimers Dement 2022). Furthermore, a subsequent analysis of data from this study showed that taking the cocoa extract did *not* reduce the rate of developing mild cognitive impairment (MCI) or dementia, nor did it slow the progression of these conditions, compared to placebo (Sachs, Alzheimers Dement 2023). Similarly, a study in the UK and Australia among 197 men and women age 55 or older (average age 65) with mild cognitive impairment (MCI) or

subjective cognitive impairment (SCI), about one-third of whom were carriers of the APOE4 gene (associated with an increased risk of Alzheimer's disease), found that consuming 33 grams (about 1.5 oz. or 1/4 a cup) of chocolate chips (providing 508 mg of cocoa flavanols including 80 mg of epicatechin) plus 3 grams of fish oil (providing a daily total of 1,100 grams of DHA and 400 mg of EPA in the triglyceride form) once daily with a meal, for one year, did not improve overall memory or cognition scores compared to placebo, or slow decreases in brain volume, including decreases in the volume of the hippocampus, a region of the brain that plays an important role in learning and memory (Vauzour, Am J Clin Nutr 2023).

Numerous earlier, smaller studies did showed some benefits with cocoa flavanols for cognitive function, particularly in older adults, those with only mild cognitive decline and those consuming at least 500 mg per day of cocoa flavanols between 5 days to 3 months. However, a review of these studies cautioned that, due to the limited number of studies, differences in dosages, timing, and the specific populations studied, more research was needed to confirm the beneficial effects of flavanols on cognition and memory (Socci, Front Nutr 2017). Many of these studies used highly concentrated cocoa flavanols produced by MARS, the maker of CocoaVia powder, which is reviewed below and is similar the products used in these studies.

A study among 100 healthy, highly educated men and women (ages 65 to 75) with normal cognition in Finland compared the effects of consuming 50 grams daily of high-flavanol dark chocolate (Karl Fazer 70% Dark Chocolate Pralines - containing 410 mg flavanols, 85 mg epicatechin) versus low-flavanol dark chocolate (86 mg flavanols, 26 mg epicatechin) daily for two months. Performance on cognitive testing improved equally in both groups (which could have been due to experience with the tests over the course of the study), but it was clear that there was no special benefit from high-dose flavanols in people who were not experiencing cognitive decline. It's not known if consuming the high-flavanol dark chocolate would have shown a benefit compared to *no* consumption of cocoa flavanols (Suominen, Exp Gerontol 2020).

A study in Spain among postmenopausal women (average age 57) found that consuming 10 grams of cocoa-rich chocolate ("99% cocoa," providing 65.4 mg of cocoa flavanols) once daily for six months did *not* improve attention, verbal memory, or working memory compared to the control group who did not consume chocolate. The chocolate—eating group modestly improved cognitive flexibility and processing speed compared to the control group, although these results would be more meaningful had a placebo product been used as the control (Garcia-Yu, Nutr Neurosci 2020).

Short-term effects:
A placebo-controlled study of healthy adults in Australia, ages 18 to 40, given a daily tablet providing 250 mg of cocoa flavanols found *short-term* improvement in self-reported **mental fatigue** while taking a mathematical test, but there were no effects on other aspects of cognitive performance, mood, or cardiovascular functioning. Interestingly, after one month, participants who had received the placebo reported feeling significantly less stressed than those receiving the cocoa flavanols (Massee, Front Pharmacol 2015).

A small study among healthy, young men (average age 24) found that consuming a high-flavanol, non-alkalized, reduced-fat cocoa beverage (*Natural Acticoa*, Barry Callebaut — providing 681.4 mg total flavanols) two hours before cognitive testing modestly improved performance on a highly demanding cognitive task, but showed no benefit for less demanding cognitive tasks, compared to consuming a low-flavanol cocoa beverage (providing 4.1 mg total flavanols). Both beverages contained similar amounts of caffeine (about 19.4 mg). Additional testing in the study suggested that the findings may be explained by an ability of cocoa flavanols to increase blood flow to the brain when carbon dioxide levels are elevated (Gratton, Sci Rep 2020). Barry Callebaut provided both cocoa beverages but did not fund the study.

A small study in Japan among 22 healthy adults (average age 35) showed that taking 25 grams (slightly less than 1 oz) of dark chocolate with a high concentration of cacao polyphenols (635 mg, with estimated 182 mg of flavanols) just before taking two 15-minute cognitively demanding tests separated by a 10 minute rest period *slightly* prevented a decline in **selective attention** during the second test (when participants experienced more mental fatigue and stress) compared to consuming chocolate with low concentration of cacao polyphenols (211.7 mg, with estimated 63 mg of flavanols). Those consuming the high polyphenol chocolate showed no

decrease in the percentage of correct answers during Stroop tests (which evaluate selective attention), while those who consumed the low polyphenol chocolate showed a *slight* decline in the percentage of correct answers. The chocolates did not have any significant effect on reaction time. The study was funded and conducted by Meiji Co. Ltd., which provided both chocolates (Sasaki, Heliyon 2024).

On the other hand, a study among 36 healthy university students (age range: 19 to 29) showed that consuming a cocoa powder beverage containing either 415 mg or 623 mg of flavanols two hours prior to *basic* cognitive testing did *not* significantly improve accuracy, reaction time, inattention or impulsivity compared to a placebo beverage. It is possible that enhancement effects of cocoa flavanols were not observed in this study because the participants were generally high-cognitive functioning and the tests did not involve higher-level cognitive control under varying levels of demand. Barry Callebaut company supplied the cocoa powders but had no further involvement in the study (Altinok, Nutrition 2025).

Mood and Stress

Several clinical studies have evaluated dark chocolate or beverages containing cacao flavanols for improving mood in healthy adults, but results have been mixed.

A placebo-controlled study of healthy adults in the UK given 25 grams daily of dark chocolate containing 500 mg of cocoa flavonoids (specific amount of flavanols, the predominant cocoa flavonoid, not listed), for four weeks found that levels of cortisol (a stress hormone) in saliva were significantly reduced (by 29%), compared to those given a low-flavonoid chocolate. The high-flavonoid group also reported a greater improvement in mood (a 5-point reduction on a 40 point-range "negative affect" scale, which relates to anxiety) than the low-flavonoid group (a 1.5-point reduction), but the between-group difference was not statistically significant. There was also no significant difference between the groups on "positive affect." (Tsang, Antioxidants 2019). As noted in the "Memory" section above, a study in Australia also did not find an overall effect of cocoa flavanols on mood.

A small study in Korea among 48 healthy men and women ages 20 to 30 without depression found that consuming 10 grams of "85% cocoa" dark chocolate (*Weinrich 1895 Fine Dark Chocolate*) providing 132 mg of polyphenols, three times daily for three weeks modestly decreased self-reported indicators of **negative mood** (i.e., feelings of irritability, hostility, guilt, etc.), although it did not increase self-reported positive mood (i.e. feelings of inspiration, enthusiasm, excitement, etc.) compared to a control group that did not consume chocolate. Consumption of the same amount of dark chocolate made with a lower percentage of cocoa (70% cocoa — providing 82.1 mg of polyphenols per serving) had no effect on mood. Consumption of the 85% cocoa dark chocolate led to changes in the presence and diversity of bacteria in the gut, that were associated with the decrease in negative mood (Shin, J Nutr Biochem 2021).

A study among 60 healthy, middle-aged Japanese women (average age: 52) showed that consuming 200 mL (about 6.7 fl oz) of a cacao beverage containing 240 mg of cacao flavanols, including 120 mg of catechin, epicatechin, procyanidin B2, procyanidin B5, procyanidin C1 and cinnamtannin A2 daily for 8 weeks did *not* significantly reduce fatigue or improve overall mood or aspects of mood including friendliness, tension, anxiety, anger, confusion, or depression compared to placebo, although **energetic feelings increased** slightly in the cacao beverage group. It is possible that this improvement was due to the small amount of caffeine (19 mg) as well as methylxanthines (which can have mild stimulant effects) present in the cacao beverage but not placebo (Murakami, Nutrients 2023). This study was funded by the manufacturer of the cacao beverage.

A U.S. population study found that people who consumed dark chocolate had 70% lower odds of reporting clinically relevant depressive symptoms than those who did not consume dark chocolate. This association did not exist for non-dark chocolate consumption (Jackson, Depress Anxiety 2019).

Skin

Taking cocoa flavanols may have a *very slight* benefit on facial wrinkles, skin elasticity, and moisture retention, possibly due to antioxidant activity. A laboratory study also suggests cocoa might increase the secretion and expression of type 1 collagen protein in skin cells (Lee, Curr Issues Mol Biol 2024).

A study in South Korea among 75 men and women (average age 45) found that taking 4 grams of cocoa powder daily (as pills taken with water -- providing a total of 286 mg of cocoa flavanols) for 12 weeks resulted in a slight, although statistically significant, decrease in the depth of **wrinkles around the eyes ("crow's feet")** of about 0.010 millimeters compared to a very slight increase of about 0.001 millimeters among those receiving a placebo. Cocoa also increased **skin moisture** around the corner of the eyes slightly more than placebo (4.5% vs 3% increase). The cocoa powder pills used in the study do not appear to be sold in the U.S. (Lee, Curr Issues Mol Biol 2024).

A study of 64 women in South Korea (average age 67) with moderate sun damage to the skin and visible wrinkles found that consuming 4 grams daily of processed cocoa powder (providing 320 mg of cocoa flavanols, in a low-fat beverage) daily for 24 weeks did *not* decrease the depth of "crow's feet" **wrinkles**, although the depth increased by 8 percent among those receiving placebo. **Skin elasticity** improved by about 9% in the cocoa flavanol group, while there was no improvement in the placebo group. There was no significant effect on skin hydration. The women were not permitted to consume other foods high in antioxidants around the time of the study. In a subgroup of the women who were exposed to artificial UV radiation at the end of the study, those who drank the cocoa beverage required a higher dose of radiation to induce skin damage, suggesting cocoa might have a protective effect. The cocoa was provided by Barry Callebaut (Belgium) (Yoon, J Nutr 2015).

Vision

A small study found that adults in their 20's (with no eye disease) had greater **visual acuity** when tested about two hours after eating a bar of dark chocolate (*Trader Joe's 72% Cacao Dark Chocolate*) than after a bar of milk chocolate (*Trader Joe's Crispy Rice Milk Chocolate*). Small-letter contrast sensitivity was significantly greater with dark chocolate. Large-letter contrast sensitivity was only slightly greater with dark chocolate and this was not statistically significant. The study had several limitations including a lack of comparison to baseline vision (i.e., before chocolate), the investigators' knowledge of the identities of both bars, and self-reported measures of visual acuity, i.e., participants read eye charts mounted on the wall. The published study references ConsumerLab's results for the cocoa flavanol level in the dark chocolate bar (316.3 mg), which was much higher than in the milk chocolate (40 mg). The researchers speculate that increased blood flow to the retina or brain might explain the results (Rabin, JAMA Ophthalmol 2018). *These results were later contradicted by a more rigorous study* that was double-blinded (neither the researchers nor the participants knew which type of chocolate was consumed), included an objective measure (a scan that measures blood flow in the eye), and measured visual acuity at baseline (before chocolate consumption). This study found no improvement in visual acuity or blood flow in the eye two hours after dark chocolate (20 grams of dark chocolate providing 400 mg total flavanols) was consumed compared to milk chocolate (7.5 grams containing 5 mg total flavanols). The dark chocolate used in the study was *Lavlé Belgian Chocolate*, by The Good Chocolate Company in Belgium (Siedlecki, JAMA Ophthalmol 2019).

Analysis of data from the large COSMOS trial among older adults (average age 72) showed that taking cocoa extract (providing 500 mg of flavanols with 80 mg of (-)-epicatechin) daily for about 3 ½ years did *not* prevent or slow the progression of **age-related macular degeneration (AMD)** compared to placebo. Although analysis of results from *only the first two years of the study* showed that cocoa flavanol supplementation reduced the risk of *visually significant* AMD by about 39% compared to placebo, there was no reduction in the *overall* risk of AMD onset or progression, and there was no significant benefit of cocoa supplementation for any outcome beyond two years (Christen, JAMA Ophthalmol 2025).

Cancer

Although laboratory studies have suggested that flavonoids in chocolate may have anti-cancer activity, studies in people have generally not found a benefit.

As discussed above, daily supplementation with cocoa extract (500 mg of flavanols per day) for three years did *not* decrease the cancer risk in older, healthy adults without a recent history of cancer (diagnosis within two years of the start of the study) compared to placebo (Sesso, Am J Clin Nutr 2022).

In addition, a large observational study (the Women's Health Initiative Study), which included data on chocolate candy exposure for 114,281 women (average age 64), found that chocolate candy intake (type of chocolate not specified) was not associated with the risk of **invasive total cancer** or invasive **breast cancer**. Furthermore, the risk of invasive **colorectal cancer** was 18% higher for women who consumed an ounce (28.4 grams) of chocolate candy at least 1.5 times *per week* compared to those who consumed an ounce of chocolate less than once *per month* (Greenberg, J Acad Nutr Diet 2020). Since frequent chocolate consumption may contribute to adiposity (overweight/obesity), a risk factor for colorectal and certain other cancers, and there's no strong evidence supporting the benefit of chocolate for cancer prevention, *it would not seem beneficial to increase chocolate intake to lower cancer risk*.

Intestinal Health

A placebo-controlled 27-day study in which a high-flavanol cocoa powder was fed daily to young pigs (which have intestinal systems similar to those of humans) found significant increases in beneficial bacteria *L. casei* and *Bifidobacterium* at doses providing 205 mg to 410 mg of cocoa flavanols (from 10 grams to 20 grams of Acticoa powder from Barry-Callebaut) (Jang, J Nutr 2016). The results are similar to those from a study in healthy people in which consumption of 494 mg of cocoa flavanols daily from a drink significantly increased fecal levels of the same bacteria, while inhibiting potentially pathogenic *Clostridium* bacteria (Tzounis, Am J Clin Nutr 2011). These studies suggest that cocoa can have a "prebiotic" effect and "support intestinal health," according to the researchers.

Caffeine and Theobromine

Naturally present in cocoa, caffeine and theobromine promote alertness (by blocking cell receptors for adenosine — a hormone that promotes sleep) (Martinez-Pinilla, Front Pharmacol 2015). Theobromine can also relax blood vessels and have a diuretic effect (increasing urination) and, in the past, was used as a heart medication and for bronchodilation (to improve breathing). Taking theobromine decreased LDL ("bad") cholesterol by 5.6% in a study in which 500 mg of theobromine was taken daily by overweight but otherwise healthy men and women for four weeks (Smolders, Clin Nutr 2017). The amount of theobromine used in this study is only slightly more than the 300 to 400 mg ConsumerLab found in single, 40-gram servings of dark chocolates (cocoa powders contained about 100 mg per 5-gram tablespoon).

Theobromine has been unsuccessfully tried as a cough suppressant in people with chronic cough not due to illness or conditions such as COPD (Morice, J Thorac Dis 2017).

However, both compounds may also cause side effects (see Concerns and Cautions).

Quality Concerns and Tests Performed:

As noted above, there can be wide variation in the flavanol concentrations of cocoa-based products. In addition, heavy metals can contaminate cocoa plants and cocoa-based products. Consequently, ConsumerLab.com tested a variety of cocoa and cacao products for their amounts of flavanols, as well as for the heavy metals lead, cadmium, and arsenic.

Although for many years there was scientific uncertainty about how to properly measure flavanols in cocoa products, in 2012 a validated method, using high performance liquid chromatography (HPLC), was developed and published by the AOAC International, allowing for more standardized measurement. This is the method utilized by ConsumerLab.com, and, in 2020, a modified version of this method was accepted by AOAC International as the official method for testing for cocoa flavanols. For more details about the testing, see How Products Were Evaluated.

[**Note:** Due to popular interest in this category and the wide range of products, the results reported are cumulative: they include those published in late 2019 and 2022. The products are identified by the year reported.]

What CL Found:

The primary goal of our testing was to find out which products provided the greatest amounts of cocoa flavanols — as they are potentially beneficial -- with the least contamination from cadmium, lead, and other toxic heavy metals. We used these laboratory findings, along with taste tests and price comparisons, to determine our ***Top Picks***.

Getting the Most Cocoa Flavanols

As shown with brown bars in the graph below, ConsumerLab.com found the *concentration* of cocoa flavanols in products to be as high as 588.4 mg/g (milligrams per gram) in *CocoaVia Heart & Brain*, which is a highly-concentrated cocoa extract, to as little as 0.6 mg/g in *Nestle Hot Cocoa Mix* (which actually contains more sugar, corn syrup, dairy solids, and vegetable oil than cocoa). Interestingly, *Nestle's 100% Pure Cocoa Powder* provided nearly 7 times the amount of flavanols (4 mg/g) as its cocoa mix.

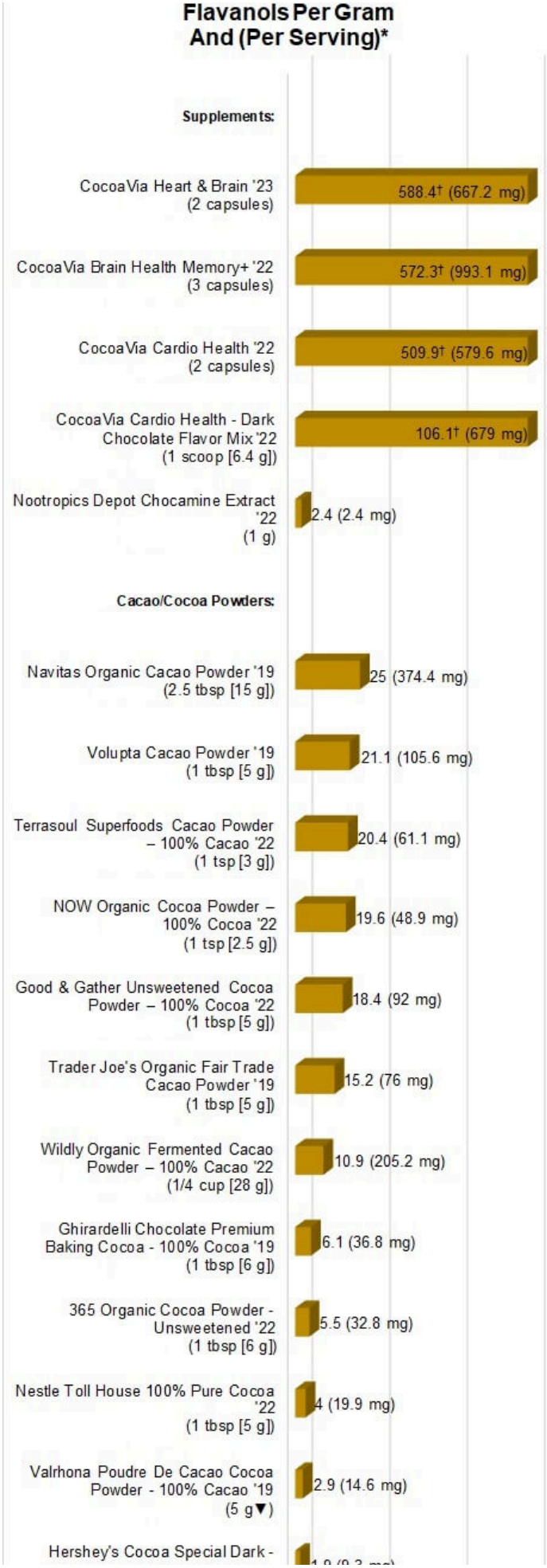
Shown in parentheses in the graph are the amounts of flavanols *per serving* — which are greatly affected by listed serving sizes (ranging from as little as about 1 gram for some supplements to as much as 40 grams for some chocolates bars. Flavanols per serving ranged from just 2.4 mg in a 1-gram serving of *Nootropics Depot Chocamine Extract* (although this "extract" is certainly not high in flavanols) to 993.1 mg in 3 capsules of *CocoaVia Memory+*. Keep in mind that clinical studies showing any positive effect of cocoa flavanols have typically used products providing about 200 mg to 900 mg of flavanols per day.

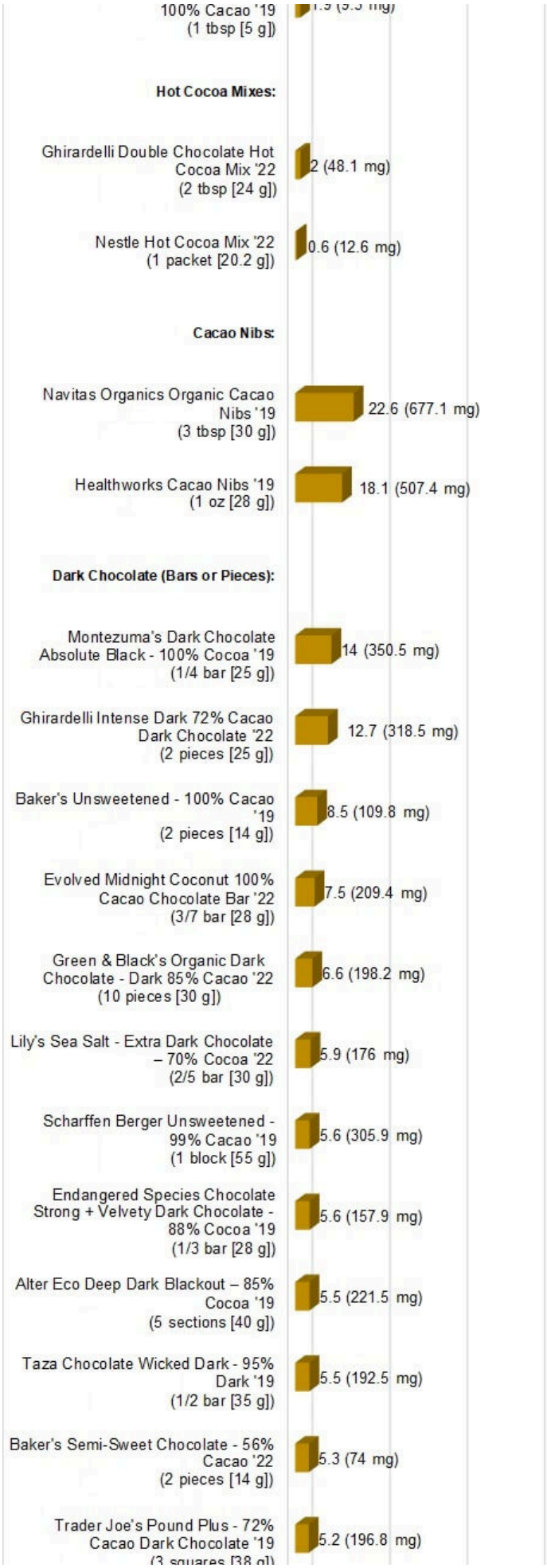
Cocoa powders and nibs -- We found as much as 25 mg/g in *Navitas Organic Cacao Powder* (which was a bit higher than in *Navitas'* nibs) to as little as 1.9 mg/g in *Hershey's Cocoa Special Dark 100% Cocoa* (even a cocoa powder *mix*, from *Ghirardelli*, had slightly more flavanols than *Hershey's* cocoa powder).

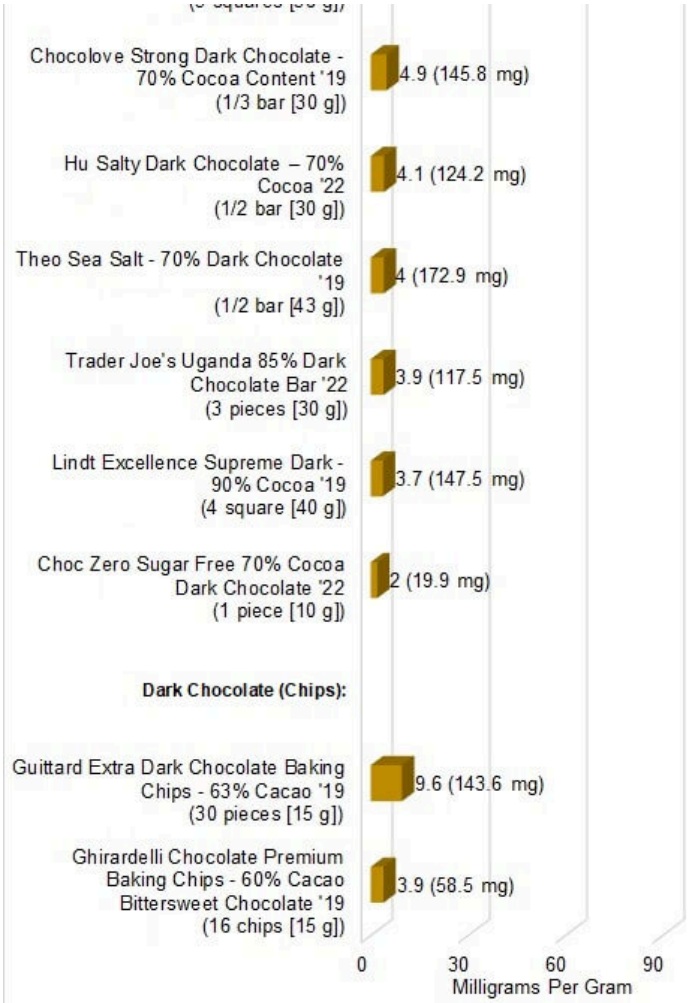
Navitas powder was tested in 2019 and, at the time, listed Peru as the source of its powder and nibs. Its source of powder is currently listed as Sierra Leone (which is in West Africa); it is possible that it now provides a lower amount of flavanols according to findings of a small study that found cocoa powder from West Africa, Dominican Republic, and Venezuela to have lower flavanol levels than powder from Peru (Razola-Diaz, Antioxidants (Basel) 2023). On the other hand, it could potentially have less cadmium, as suggested by a study that found cocoa beans from Africa to have lower cadmium levels than those from Latin America, particularly Peru. *Navitas nibs* no longer cite a geographic source, stating only "Fair Trade."

Dark chocolates and chips — We found as much as 14 mg/g in *Montezuma's Dark Chocolate Absolute Black — 100% Cocoa* to as little as 2 mg/gram in *Choc Zero 70% Cocoa Dark Chocolate*.

Not surprisingly, Dutched (alkali processed) cocoas and chocolates generally had lower flavanol concentrations than similar products, as the Dutching process reduces flavanol levels, creating a milder (less bitter) flavor. Dutched products are indicated in the 3*rd* column of the Results table.


Flavanols Per Gram And (Per Serving)*
Supplements:
CocoaVia Heart & Brain '23 (2 capsules)
588.4† (667.2 mg)
CocoaVia Brain Health Memory+ '22 (3 capsules)
572.3† (993.1 mg)
CocoaVia Cardio Health '22 (2 capsules)
509.9† (579.6 mg)
CocoaVia Cardio Health - Dark Chocolate Flavor Mix '22 (1 scoop [6.4 g])
106.1† (679 mg)
Nootropics Depot Chocamine Extract '22 (1 g)
2.4 (2.4 mg)
Cacao/Cocoa Powders:
Navitas Organic Cacao Powder '19 (2.5 tbsp [15 g])
25 (374.4 mg)
Volupta Cacao Powder '19 (1 tbsp [5 g])
21.1 (105.6 mg)
Terrasoul Superfoods Cacao Powder – 100% Cacao '22 (1 tsp [3 g])
20.4 (61.1 mg)
NOW Organic Cocoa Powder – 100% Cocoa '22 (1 tsp [2.5 g])
19.6 (48.9 mg)
Good & Gather Unsweetened Cocoa Powder – 100% Cocoa '22 (1 tbsp [5 g])
18.4 (92 mg)
Trader Joe's Organic Fair Trade Cacao Powder '19 (1 tbsp [5 g])
15.2 (76 mg)
Wildly Organic Fermented Cacao Powder – 100% Cacao '22 (1/4 cup [28 g])
10.9 (205.2 mg)
Ghirardelli Chocolate Premium Baking Cocoa - 100% Cocoa '19 (1 tbsp [6 g])
6.1 (36.8 mg)
365 Organic Cocoa Powder - Unsweetened '22 (1 tbsp [6 g])
5.5 (32.8 mg)
Nestle Toll House 100% Pure Cocoa '22 (1 tbsp [5 g])
4 (19.9 mg)
Valrhona Poudre De Cacao Cocoa Powder - 100% Cacao '19 (5 g▼)
2.9 (14.6 mg)
Hershey's Cocoa Special Dark -


100% Cacao '19
(1 tbsp [5 g])
Hot Cocoa Mixes:
Ghirardelli Double Chocolate Hot Cocoa Mix '22
(2 tbsp [24 g])
2 (48.1 mg)
Nestle Hot Cocoa Mix '22
(1 packet [20.2 g])
0.6 (12.6 mg)
Cacao Nibs:
Navitas Organics Organic Cacao Nibs '19
(3 tbsp [30 g])
22.6 (677.1 mg)
Healthworks Cacao Nibs '19
(1 oz [28 g])
18.1 (507.4 mg)
Dark Chocolate (Bars or Pieces):
Montezuma's Dark Chocolate Absolute Black - 100% Cocoa '19
(1/4 bar [25 g])
14 (350.5 mg)
Ghirardelli Intense Dark 72% Cacao Dark Chocolate '22
(2 pieces [25 g])
12.7 (318.5 mg)
Baker's Unsweetened - 100% Cacao '19
(2 pieces [14 g])
8.5 (109.8 mg)
Evolved Midnight Coconut 100% Cacao Chocolate Bar '22
(3/7 bar [28 g])
7.5 (209.4 mg)
Green & Black's Organic Dark Chocolate - Dark 85% Cacao '22
(10 pieces [30 g])
6.6 (198.2 mg)
Lily's Sea Salt - Extra Dark Chocolate – 70% Cocoa '22
(2/5 bar [30 g])
5.9 (176 mg)
Scharffen Berger Unsweetened - 99% Cacao '19
(1 block [55 g])
5.6 (305.9 mg)
Endangered Species Chocolate Strong + Velvety Dark Chocolate - 88% Cocoa '19
(1/3 bar [28 g])
5.6 (157.9 mg)
Alter Eco Deep Dark Blackout – 85% Cocoa '19
(5 sections [40 g])
5.5 (221.5 mg)
Taza Chocolate Wicked Dark - 95% Dark '19
(1/2 bar [35 g])
5.5 (192.5 mg)
Baker's Semi-Sweet Chocolate - 56% Cacao '22
(2 pieces [14 g])
5.3 (74 mg)
Trader Joe's Pound Plus - 72% Cacao Dark Chocolate '19
5.2 (196.8 mg)

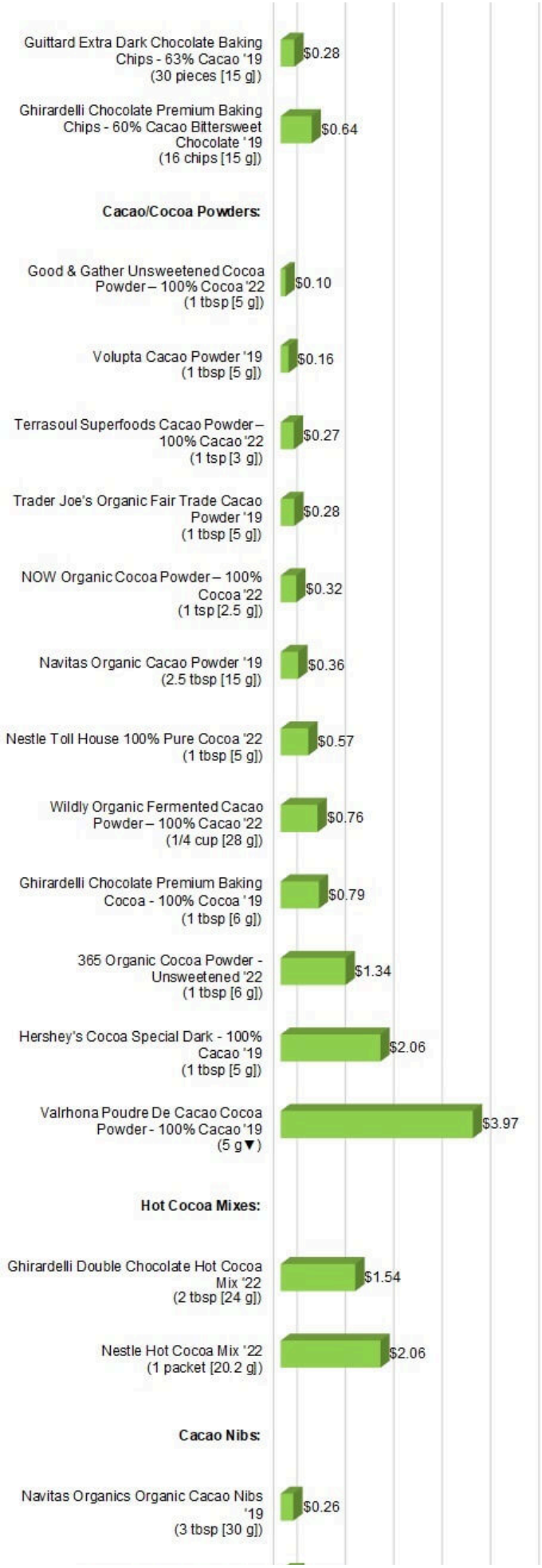


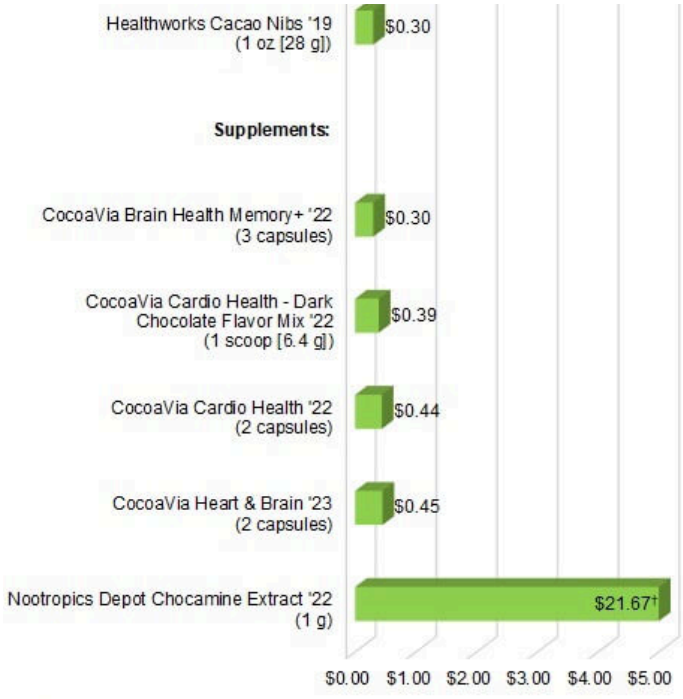
* Based on amounts found. Serving amount based on labeled serving size.
▼ Label states a serving size of "1 piece (40 g)" but, as this powder, CL applied a serving size of 1 tbsp (5 g).
† Exceeds scale of graph.

Cost for flavanols:

In terms of the *cost to get 200 mg of flavanols* from any product (shown in the graph below), this was lowest from products that were relatively high in flavanols, like some cocoa powders (as low as 10 cents from *Good & Gather*) and some *CocoaVia* supplements (as low as 30 cents). Bars were generally more expensive sources of flavanols, except for *Trader Joe's Pound Plus — 72%* which, despite a moderate level of flavanols, was relatively inexpensive ($4.99) so could deliver 200 mg of flavanols for only 39 cents. Not surprisingly, the most expensive sources of flavanols were products that were low in flavanols, like *Nootropics* extract ($21.67), *Choc Zero* dark chocolate ($5.01), and Dutched cocoa powders like *Valrhona* ($3.97).


Cost Per 200 mg of Flavanols*
Dark Chocolate (Bars or Pieces):
Trader Joe's Pound Plus - 72% Cacao Dark Chocolate '19 (3 squares [38 g])
$0.39
Baker's Unsweetened - 100% Cacao '19 (2 pieces [14 g])
$0.61
Montezuma's Dark Chocolate Absolute Black - 100% Cocoa '19 (1/4 bar [25 g])
$0.68
Trader Joe's Uganda 85% Dark Chocolate Bar '22 (3 pieces [30 g])
$0.86
Ghirardelli Intense Dark 72% Cacao Dark Chocolate '22 (2 pieces [25 g])
$0.86
Green & Black's Organic Dark Chocolate - Dark 85% Cacao '22 (10 pieces [30 g])
$1.17
Baker's Semi-Sweet Chocolate - 56% Cacao '22 (2 pieces [14 g])
$1.17
Endangered Species Chocolate Strong + Velvety Dark Chocolate - 88% Cocoa '19 (1/3 bar [28 g])
$1.33
Chocolove Strong Dark Chocolate - 70% Cocoa Content '19 (1/3 bar [30 g])
$1.51
Scharffen Berger Unsweetened - 99% Cacao '19 (1 block [55 g])
$1.59
Lindt Excellence Supreme Dark - 90% Cocoa '19 (4 square [40 g])
$1.62
Lily's Sea Salt - Extra Dark Chocolate – 70% Cocoa '22 (2/5 bar [30 g])
$1.72
Theo Sea Salt - 70% Dark Chocolate '19 (1/2 bar [43 g])
$1.77
Evolved Midnight Coconut 100% Cacao Chocolate Bar '22 (3/7 bar [28 g])
$2.01
Alter Eco Deep Dark Blackout – 85% Cocoa '19 (5 sections [40 g])
$3.09
Hu Salty Dark Chocolate – 70% Cocoa '22 (1/2 bar [30 g])
$4.26
Taza Chocolate Wicked Dark - 95% Dark '19 (1/2 bar [35 g])
$4.67
Choc Zero Sugar Free 70% Cocoa Dark Chocolate '22 (1 piece [10 g])
$5.01
Dark Chocolate (Chips):


Guittard Extra Dark Chocolate Baking Chips - 63% Cacao '19 (30 pieces [15 g])
$0.28
Ghirardelli Chocolate Premium Baking Chips - 60% Cacao Bittersweet Chocolate '19 (16 chips [15 g])
$0.64
Cacao/Cocoa Powders:
Good & Gather Unsweetened Cocoa Powder – 100% Cocoa '22 (1 tbsp [5 g])
$0.10
Volupta Cacao Powder '19 (1 tbsp [5 g])
$0.16
Terrasoul Superfoods Cacao Powder – 100% Cacao '22 (1 tsp [3 g])
$0.27
Trader Joe's Organic Fair Trade Cacao Powder '19 (1 tbsp [5 g])
$0.28
NOW Organic Cocoa Powder – 100% Cocoa '22 (1 tsp [2.5 g])
$0.32
Navitas Organic Cacao Powder '19 (2.5 tbsp [15 g])
$0.36
Nestle Toll House 100% Pure Cocoa '22 (1 tbsp [5 g])
$0.57
Wildly Organic Fermented Cacao Powder – 100% Cacao '22 (1/4 cup [28 g])
$0.76
Ghirardelli Chocolate Premium Baking Cocoa - 100% Cocoa '19 (1 tbsp [6 g])
$0.79
365 Organic Cocoa Powder - Unsweetened '22 (1 tbsp [6 g])
$1.34
Hershey's Cocoa Special Dark - 100% Cacao '19 (1 tbsp [5 g])
$2.06
Valrhona Poudre De Cacao Cocoa Powder - 100% Cacao '19 (5 g▼)
$3.97
Hot Cocoa Mixes:
Ghirardelli Double Chocolate Hot Cocoa Mix '22 (2 tbsp [24 g])
$1.54
Nestle Hot Cocoa Mix '22 (1 packet [20.2 g])
$2.06
Cacao Nibs:
Navitas Organics Organic Cacao Nibs '19 (3 tbsp [30 g])
$0.26



Avoiding Toxic Heavy Metals

In addition to seeking flavanols with cocoas and chocolates, one should also try to avoid excessive contamination with toxic heavy metals, particularly cadmium, which is a kidney toxin.

Tip: *Since cadmium, as well as lead, compete for absorption with other metals, you may be able to reduce their absorption by making sure that you're getting adequate calcium, iron, and zinc in your diet* (Nawrot, Biometals 2010).

Cadmium — A Major Problem

As shown below, the concentration of cadmium in products ranged from less than 0.005 mcg/g in several *CocoaVia* supplements to nearly 1 mcg/g in cocoa powders.

Concentrations in bars are lower than in powders due to the inclusion of additional ingredients, which dilute the cocoa powder. However, what is most important is the total dose of cadmium *per serving* (shown in parenthesis in the graph). Since serving sizes for dark chocolates and nibs are typically 25 to 40 grams, but only about 5 grams (1 tablespoon) for most cocoa powders, some dark chocolates and nibs exceed the daily limit for cadmium, which is 4.1 mcg for adults and about 3 mcg for children. Amounts in products that exceed the adult daily limit are shown in red, while those exceeding the limit only for children are shown in orange. (All of the values represented in the graph are also shown in the 2*nd* column of the Results table.)

By category, highest and lowest *cadmium concentrations* were as follows.

Cocoa powders and nibs:

Most cadmium: (At a 1-tablespoon serving, *Trader Joe's* and *Navitas Powder* exceed limit for adults, and *Hershey's* exceeds limit for children. Both nibs exceed adult limit at suggested serving sizes of 28-30 grams.)

- *Trader Joe's Organic Fair Trade Cacao Powder* — 0.98 mcg/g
- *Navitas Organic Cacao Powder* — 0.65 mcg/g*
- *Hershey's Cocoa Special Dark* — 0.64 mcg/g

- *Volupta Cacao Powder* — 0.59 mcg/g
- *NOW Organic Cocoa Powder* — 0.52 mcg/g
- *Wildly Organic Fermented Cacao Powder* — 0.45 mcg/g
- *Healthworks Cacao Nibs* — 0.45 mcg/g

Least cadmium:

- *Nestle Hot Cocoa Mix* — <0.02 mcg/g
- *Ghirardelli Double Chocolate Cocoa Mix* — 0.04 mcg/g
- *Valrhona Cocoa Powder* — 0.1 mcg/g
- *Ghirardelli Premium Baking Cocoa* — 0.1 mcg/g
- *Good & Gather Unsweetened Cocoa Powder* — 0.11 mcg/g
- *Nestle Toll House 100% Pure Cocoa* — 0.24 mcg/g

Dark chocolates and chips:

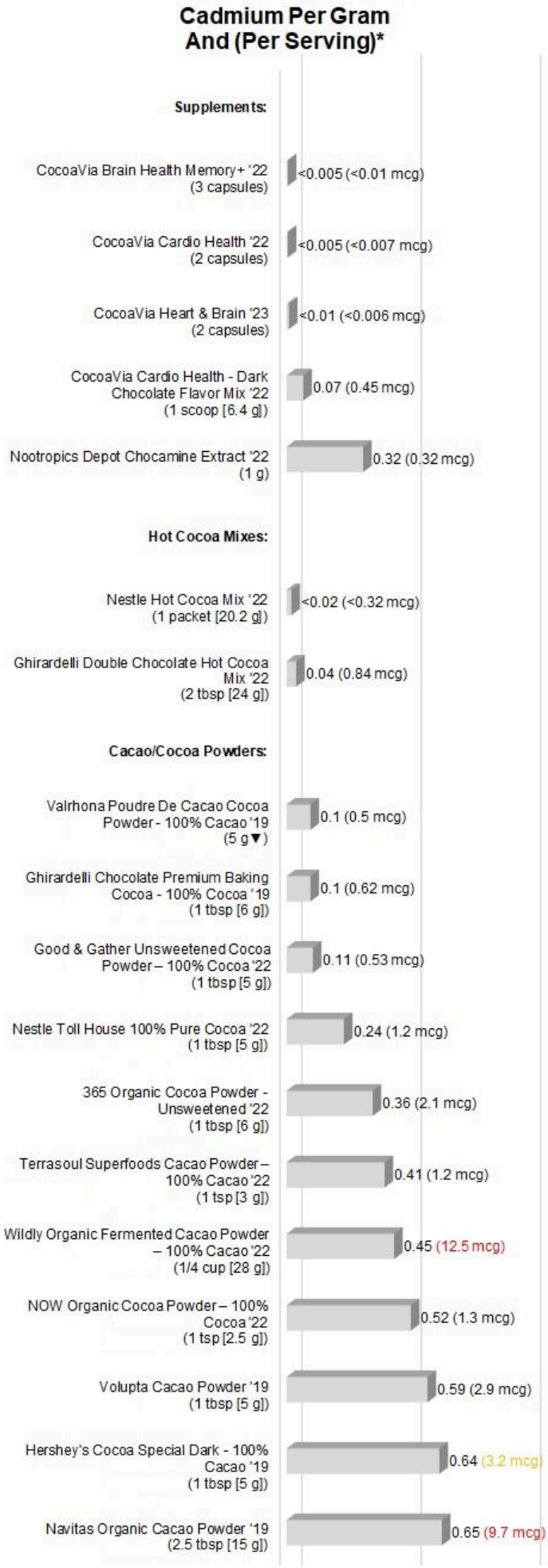
Most cadmium: (*All* exceed the adult limit at a serving of 30 grams)

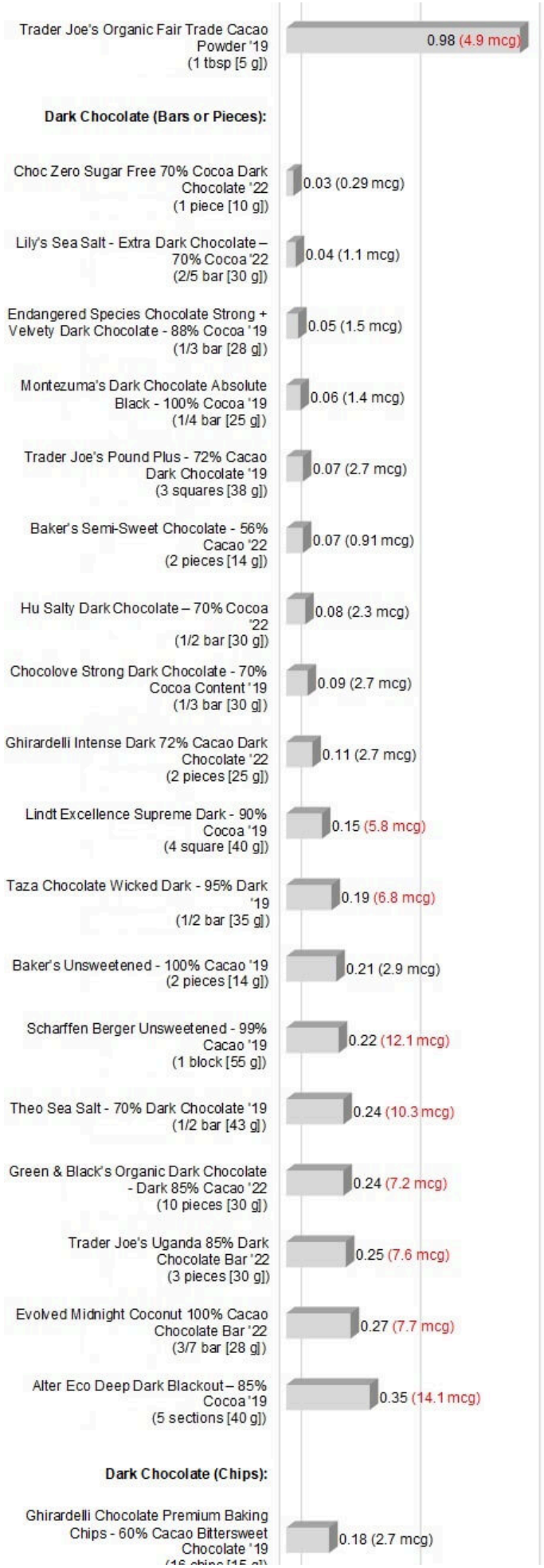
- *Alter Eco Deep Dark Blackout — 85%* — 0.35 mcg/g
- *Evolved Midnight Coconut 100% Cacao* — 0.27 mcg/g
- *Trader Joe's Uganda 85%* — 0.25 mcg/g
- *Green & Black's Organic Dark Chocolate 85%* — 0.24 mcg/g
- *Theo Sea Salt — 70%* — 0.24 mcg/g
- *Guittard Extra Dark Baking Chips — 63%* — 0.23 mcg/g (Listed serving is only 15 grams, which would exceed limit for children, but not adults)
- *Scharffen Berger Unsweetened — 99 % Cacao* — 0.22 mcg
- *Baker's Unsweetened — 100%* — 0.21 mcg (Listed serving is only 14 grams, which would not exceed limit for children or adults)
- *Taza Chocolate Wicked Dark — 95%* — 0.19 mcg/g
- *Lindt Excellence Supreme Dark — 90%* — 0.15 mcg/g

Least cadmium:

- *Choc Zero Sugar Free 70%* — 0.03 mcg/g
- *Lily's Sea Salt — Extra Dark 70%* — 0.04 mcg/g
- *Endangered Species Strong + Velvety 88%* — 0.05 mcg/g
- *Montezuma's Absolute Black — 100%* — 0.06 mcg/g
- *Trader Joe's Pound Plus — 72%* — 0.07 mcg/g

- *Baker's Semi-Sweet 56%* — 0.07 mcg/g
- *Hu Salty — 70%* — 0.08 mcg/g
- *Chocolove Strong — 70%* — 0.09 mcg/g
- *Ghirardelli Intense Dark 72%* — 0.11 mcg/g (Listed serving is only 25 grams, which is near the limit for children, but not adults)


Cadmium Per Gram And (Per Serving)*
Supplements:
CocoaVia Brain Health Memory+ '22 (3 capsules)
<0.005 (<0.01 mcg)
CocoaVia Cardio Health '22 (2 capsules)
<0.005 (<0.007 mcg)
CocoaVia Heart & Brain '23 (2 capsules)
<0.01 (<0.006 mcg)
CocoaVia Cardio Health - Dark Chocolate Flavor Mix '22 (1 scoop [6.4 g])
0.07 (0.45 mcg)
Nootropics Depot Chocamine Extract '22 (1 g)
0.32 (0.32 mcg)
Hot Cocoa Mixes:
Nestle Hot Cocoa Mix '22 (1 packet [20.2 g])
<0.02 (<0.32 mcg)
Ghirardelli Double Chocolate Hot Cocoa Mix '22 (2 tbsp [24 g])
0.04 (0.84 mcg)
Cacao/Cocoa Powders:
Valrhona Poudre De Cacao Cocoa Powder - 100% Cacao '19 (5 g▼)
0.1 (0.5 mcg)
Ghirardelli Chocolate Premium Baking Cocoa - 100% Cocoa '19 (1 tbsp [6 g])
0.1 (0.62 mcg)
Good & Gather Unsweetened Cocoa Powder – 100% Cocoa '22 (1 tbsp [5 g])
0.11 (0.53 mcg)
Nestle Toll House 100% Pure Cocoa '22 (1 tbsp [5 g])
0.24 (1.2 mcg)
365 Organic Cocoa Powder - Unsweetened '22 (1 tbsp [6 g])
0.36 (2.1 mcg)
Terrasoul Superfoods Cacao Powder – 100% Cacao '22 (1 tsp [3 g])
0.41 (1.2 mcg)
Wildly Organic Fermented Cacao Powder – 100% Cacao '22 (1/4 cup [28 g])
0.45 (12.5 mcg)
NOW Organic Cocoa Powder – 100% Cocoa '22 (1 tsp [2.5 g])
0.52 (1.3 mcg)
Volupta Cacao Powder '19 (1 tbsp [5 g])
0.59 (2.9 mcg)
Hershey's Cocoa Special Dark - 100% Cacao '19 (1 tbsp [5 g])
0.64 (3.2 mcg)
Navitas Organic Cacao Powder '19 (2.5 tbsp [15 g])
0.65 (9.7 mcg)


Trader Joe's Organic Fair Trade Cacao Powder '19 (1 tbsp [5 g])
0.98 (4.9 mcg)
Dark Chocolate (Bars or Pieces):
Choc Zero Sugar Free 70% Cocoa Dark Chocolate '22 (1 piece [10 g])
0.03 (0.29 mcg)
Lily's Sea Salt - Extra Dark Chocolate – 70% Cocoa '22 (2/5 bar [30 g])
0.04 (1.1 mcg)
Endangered Species Chocolate Strong + Velvety Dark Chocolate - 88% Cocoa '19 (1/3 bar [28 g])
0.05 (1.5 mcg)
Montezuma's Dark Chocolate Absolute Black - 100% Cocoa '19 (1/4 bar [25 g])
0.06 (1.4 mcg)
Trader Joe's Pound Plus - 72% Cacao Dark Chocolate '19 (3 squares [38 g])
0.07 (2.7 mcg)
Baker's Semi-Sweet Chocolate - 56% Cacao '22 (2 pieces [14 g])
0.07 (0.91 mcg)
Hu Salty Dark Chocolate – 70% Cocoa '22 (1/2 bar [30 g])
0.08 (2.3 mcg)
Chocolove Strong Dark Chocolate - 70% Cocoa Content '19 (1/3 bar [30 g])
0.09 (2.7 mcg)
Ghirardelli Intense Dark 72% Cacao Dark Chocolate '22 (2 pieces [25 g])
0.11 (2.7 mcg)
Lindt Excellence Supreme Dark - 90% Cocoa '19 (4 square [40 g])
0.15 (5.8 mcg)
Taza Chocolate Wicked Dark - 95% Dark '19 (1/2 bar [35 g])
0.19 (6.8 mcg)
Baker's Unsweetened - 100% Cacao '19 (2 pieces [14 g])
0.21 (2.9 mcg)
Scharffen Berger Unsweetened - 99% Cacao '19 (1 block [55 g])
0.22 (12.1 mcg)
Theo Sea Salt - 70% Dark Chocolate '19 (1/2 bar [43 g])
0.24 (10.3 mcg)
Green & Black's Organic Dark Chocolate - Dark 85% Cacao '22 (10 pieces [30 g])
0.24 (7.2 mcg)
Trader Joe's Uganda 85% Dark Chocolate Bar '22 (3 pieces [30 g])
0.25 (7.6 mcg)
Evolved Midnight Coconut 100% Cacao Chocolate Bar '22 (3/7 bar [28 g])
0.27 (7.7 mcg)
Alter Eco Deep Dark Blackout – 85% Cocoa '19 (5 sections [40 g])
0.35 (14.1 mcg)
Dark Chocolate (Chips):
Ghirardelli Chocolate Premium Baking Chips - 60% Cacao Bittersweet Chocolate '19
0.18 (2.7 mcg)

Values in red exceed 4.1 mcg per serving which exceeds CL limit. Values in orange are above 3.0 mcg but below 4.1 mcg per serving, which exceeds the Health Canada limit for children.
* Based on amounts found. Serving amount based on labeled serving size.
▼ Label states a serving size of "1 piece (40 g)" but, as this powder, CL applied a serving size of 1 tbsp (5 g).

How dangerous is the cadmium from cocoa and chocolate?

Cadmium is a probable carcinogen (i.e., cancer-causing agent), can be toxic to the kidneys, can soften the bones -- causing bone pain, and may affect fetal development. Cadmium accumulates in the body due to its long biological half-life in humans of 10 to 35 years. It has been conservatively estimated that an adult weighing 150 lbs can tolerate *total* ongoing daily exposure to cadmium (that is, from *all* sources of exposure — food, drink, air) of up to 25 mcg, while a child of half that weight can tolerate about 12 mcg (EFSA 2011).

The concentrations of cadmium in plant-based foods that are normally considered "high" in cadmium, such as peanuts and sunflower seeds, have been found to range from 0.05 to 0.12 mcg per gram; which means that the cadmium concentrations in many cocoa powders tested by ConsumerLab.com were *10 to 20 times higher* than in these cadmium-rich foods (ATSDR 2012). In addition, a daily serving of many cocoa products exceeds the limit in California of 4.1 mcg, above which a warning is to appear on the label, and the limit in Canada where a daily serving of a natural health product must contain no more than 6 mcg of cadmium for an individual weighing 150 lbs and 3 mcg for a 75 lb individual, such as a child.

Unfortunately, the U.S. government has not set a limit for cadmium in supplements or foods. The European Union has established a cadmium limit of 0.6 mcg per gram of cocoa powder, which many cocoa powders tested in this review would violate.

The European limit on cadmium in chocolates with 30% to 50% cacao is 0.3 mcg per gram, although it allows chocolate with over 50% cacao, i.e., most dark chocolates, 0.8 mcg per gram. None of the tested chocolate bars exceeded the European concentration limit for high-cacao chocolate but several would exceed the lower limit. It should be noted that the European cadmium limit on high-flavanol dark chocolate is lenient and likely considers the potential economic impact on cocoa producers of stricter limits. Its limit for milk chocolate is *just 0.1 mcg* per gram due to particular concern for children, who tend to eat more milk chocolate than dark chocolate and have a lower daily tolerance for cadmium due to smaller body size. More than half the chocolates in this Review exceed 0.1 mcg of cadmium per gram.

Why is there cadmium in cocoa and chocolate?

Similar to CL's results in this Review, a study published in 2017 by researchers from the U.S. FDA of 144 cocoa and chocolate products (not identified by name) sold in the U.S. showed that the highest cadmium concentrations were in cocoa powders (averaging 0.7 mcg/g). This was followed by cocoa nibs (0.62 mcg/g), dark chocolates (0.27 mcg/g), and very low levels in milk chocolates (0.06 mcg/g). Lead was also highest in cocoa powders (0.11 mcg/g) with only negligible amounts in other products — the lowest being cocoa nibs (0.003 mcg/g) (Abt, Food Add & Contam 2017). A study of cadmium in cacao from plantations in Peru found that 57% of cacao bean samples exceeded 0.8 mcg per gram, with the highest levels (up to 1.79 mcg per gram) coming from northern Peru (Arevalo-Gardini, Sci Tot Environ 2017). (Note that cadmium is found in the cocoa solids and is not present in cocoa butter, nor, for the same reason, in white chocolate).

It's interesting to note that "organic" products were generally more contaminated with cadmium than non-organic products — a phenomenon that ConsumerLab.com has observed in the past and noted in other Reviews.

Although most products did not list the geographic source of their cacao beans (see 5th column of Results table), nearly all those that did indicated areas in Central or South America, particularly Peru. A study of cocoa-based products by researchers at Tulane University found that dark chocolates sourced from Central and South America exhibited the highest mean levels of cadmium, and South America samples also contained elevated lead, whereas those from West Africa and Asia had low cadmium and lead (Godebo, Food Res Int 2024). Similarly, the above-mentioned study by U.S. government researchers that found higher concentrations of cadmium in products from Latin America than from Africa. It was noted that although most of the world's cocoa beans come from Africa, only the varieties from Latin American produce the "fine cocoas" (i.e., those having desirable flavor and color) that are used to make specialty dark chocolates and many cocoa powders (Abt, Food Add & Contam 2017).

The amount of cadmium in cacao beans increases with the amount of cadmium in the soil in which it grows and with increased acidity of the soil. Cadmium naturally accumulates in soil due to volcanic activity, forest fires, and the weathering of rocks (Wade, PLOS One 2022).

Lead — Some concern for children

None of the dark chocolate, pure cocoa, nibs, or supplements products exceeded limits for lead or arsenic applied by ConsumerLab.com. However, **the two cocoa mixes are of concern for children due to lead**.

CL applies particularly strict limits to products marketed to children, especially with regard to lead. Among all the tested products, the two hot cocoa mixes would seem the mostly likely to be given to children. These were very low in cadmium and arsenic. They were also relatively low in lead, similar to other cocoa powders, but due to their much larger serving sizes (20 to 24 grams of powder per packet), lead per serving amounted to 1.6 mcg in *Ghirardelli Double Chocolate Hot Cocoa Mix* and 0.73 mcg in *Nestle Hot Cocoa Mix*. These exceed our limit for cocoa powders for children of 0.5 mcg per serving. While occasional exposure to this amount of lead is not likely to be problematic, it would seem prudent to avoid regular exposure as well as minimize the amount of exposure, i.e., the *Nestle* hot cocoa mix would be preferable to *Ghirardelli* in this regard, and *Nestle* also has less cadmium and less sugar than *Ghirardelli* — although *Ghirardelli* provides more flavanols.

In chocolates (as well as candies) that may be frequently consumed by children, the FDA limits the concentration of lead to 0.1 mcg/g — a limit that we apply in this Review. None of the dark chocolates exceeded this. In fact, all had 0.04 mcg/g or less, except for *Trader Joe's Uganda 85%* which had a bit more — 0.06 mcg/g, which amounts to 1.9 mcg per 30 gram serving.

[**Update (6-23-25): *365 Whole Foods Organic Cocoa Powder*:** The testing group Lead Safe Mama recently reported finding higher levels of cadmium (0.843 mcg/g) and lead (0.1057 mcg/g) in this product than we found in 2022, with more than twice the cadmium (5 mcg vs 2.1 mcg) and more lead (0.63 mcg vs 0.33 mcg) per 6-gram tablespoon. Consumer Reports found 3.8 mcg of cadmium per tablespoon in this product 2023. The amount of cadmium reported by Lead Safe Mama would exceed ConsumerLab's limits for cadmium for children and adults (3 mcg and 4.1 mcg, respectively), and the amount of lead exceeds the California limit (0.5 mcg/day), above which a product requires a warning of reproductive harm (based on chronic use). Very low levels of arsenic and mercury were also reported. We would *not* recommend such a product for children and suggest adults choose a powder with less cadmium or limit use to occasional consumption. This product was not a *Top Pick* of ours in 2022 due to relatively low cocoa flavanol content that we found -- likely due to the fact that it is Dutch processed. Be aware that Lead Safe Mama displays its findings in terms of "% of Action Level" which may be misleading, as we have previously noted.)

Update (5-23-24): Tulane University

In April 2024, researchers at Tulane University published a report based on tests for heavy metals in 155 samples of chocolate and cocoa products purchased in the U.S. Although they did not publish results for each product, they identified those with the highest levels of **cadmium** per ounce (29.35 grams) as *Lok Dark Chocolate* (24 mcg), *Marou Faiseurs de Chocolate* (20 mcg), *Mexican Vivio Foods organic cacao powder* (19.5 mcg), *Peruvian Pascha dark chocolate chips* (15 mcg), and *Pralus Pyramid dark chocolate* (15 mcg), *Alter Eco*

Total Blackout (14 mcg), and *Trader Joe's Chocolate Passport* (12 mcg). Each one of these far exceeds the cadmium limit applied by ConsumerLab of 4.1 mcg per daily serving. Chocolate bars found to have the highest concentrations of **lead** per ounce were *Napolitains Dark* (18 mcg) and *Blanxart chocolate* (15 mcg) — levels that far exceed ConsumerLab's limits for adults (4 mcg) and children (2.8 mcg per ounce) and those found in this Review. Products were also tested for **uranium** (a radioactive heavy metal which may cause kidney damage if consumed in very high amounts over a long period of time) and **thorium** (a weakly radioactive chemical that may be carcinogenic), although the results did not raise concerns (Godebo, Food Res Int 2024).

Update (10-26-23): Consumer Reports' Tests

After publication of this Review, Consumer Reports published its own tests of heavy metals in cocoa-based products in 2022 and 2023. It did not test for flavanols, but it found cadmium and lead in all products. However, in presenting its findings regarding lead, it did not apply the FDA limit designed to protect children (0.1 mcg/g), but, instead, used the more stringent California Prop 65 limit of 0.5 mcg *per daily serving* (standardized to 1 ounce or 28.35 grams by Consumer Reports), which focuses primarily on reproductive harm, although a court settlement in California allows higher amounts in many cocoa-based products due to inherent contamination issues, e.g., 0.15 mcg/g for products with >65% to 95% cacao, dropping to 0.1 mcg/g in February 2024) (Superior Court of California 2018). None of the dark chocolates tested by Consumer Reports exceeded FDA or California settlement limits.

While the reporting by Consumer Reports helped bring needed attention to the issue of dark chocolate contamination, we believe that its presentation of lead results may raise alarm about products that do not pose a significant lead exposure risk to most adults.

The FDA has established maximum daily intakes (i.e., daily limits) for lead from all sources of exposure, called the Interim Reference Levels (IRLs). The limits were reduced by the FDA in 2018: For children, the limit was reduced to 3 mcg from 6 mcg per day. For all adults, it was lowered to 12.5 mcg per day, having previously been 25 mcg for pregnant women and 70 mcg for other adults. According to the agency, the new lower limit for adults helps to protect against possible fetal exposure in women who are unaware that they are pregnant, and against infant exposure during nursing. In our Review, we found that the majority of dark chocolates and other cocoa-based products contained less than 1 mcg of lead per suggested serving. The highest amount, as noted above, was 1.9 mcg, in a 30-gram serving of *Trader Joe's Uganda 85%* dark chocolate.

The largest amounts of lead reported by Consumer Reports in chocolates were 2.7 mcg and 1.57 mcg per ounce, respectively, in *Perugina's 85%* and *70% Premium Dark Chocolate*, and 1.33 mcg per ounce of *Hershey's Special Dark Mildly Sweet Chocolate*. In cocoa powders and mixes, the largest amounts were 1.73 mcg in 3 tablespoons of *Great Value (Walmart) Milk Chocolate Flavor Hot Cocoa Mix* and 1.62 mcg per tablespoon of *Drost Cacao Powder*). Among chocolate brownie and cake mixes, the largest amounts were 1.09 mcg per serving of *Bob's Red Mill Gluten Free Chocolate Cake Mix*, which was about 2 to 6 times the amount found in similar products.

For cadmium, the largest amount found by Consumer Reports was in *Evolved Signature Dark 72% Cacao Chocolate Bar* (6.1 mcg per ounce), which is similar to what ConsumerLab found in *Evolved Midnight Coconut 100% Cacao Chocolate Bar* (7.7 mcg per 28 ounces serving). *Sam's Choice (Walmart) Dark Chocolate 72%* had the next highest amount of cadmium: 4.8 mcg per ounce. Consumer Reports found 3.9 mcg of cadmium per tablespoon of *BetterBody Foods Organic Cacao Powder* and a bit more cadmium than ConsumerLab found in *365 Whole Foods Organic Cocoa Powder* (3.8 mcg vs. 2.1 mcg per tablespoon). Among hot cocoa mixes, *Trader Joe's Organic Hot Cocoa Mix* had the most cadmium -- 3.6 mcg per envelope, which was 2 to 7 times the amount in other mixes.

Why is there lead in cocoa and chocolates?

Interestingly, the lead content of cocoa products appears to be related to harvesting and manufacturing practices rather than lead in cacao beans themselves. The researchers suggested that lead in chocolate products may be due to a combination of factors, including contamination from cacao bean shells (which appear to scavenge lead from sources such as gasoline emissions), as well as contamination during the fermentation and drying stages and during shipping and processing (Rankin, Environ Health Perspect 2005).

Calories

Calories in cocoa and dark chocolate products come mainly from their cocoa butter (9 Calories per gram) and added sugars (4 Calories per gram). As cocoa supplements typically contain little to no sugar and minimal cocoa butter, they provide few calories. Similarly,

unsweetened cocoa powders contain no sugar and generally little cocoa butter, so a tablespoon (about 5 grams) typically provides only 10 to 20 Calories. Cocoa nibs naturally contain cocoa butter, so a 3-tablespoon serving (15 grams) may provide about 7 grams of fat and 150 Calories. Dark chocolate typically includes the most cocoa butter and sugar, so that a 40-gram serving will provide around 250 Calories -- or about 200 Calories if not sweetened with sugar.

One of the products, *Lily's*, was lower in calories (160 Calories per 40 grams) than the others because of its use of non-sugar sweeteners, such as erythritol and stevia, and other ingredients allowing for a reduction in cocoa butter. Similarly, *Choc Zero* has no added sugar and derives sweetness from monk fruit; it delivers only 45 Calories per serving, although a serving is only 10 grams, so, per gram, it's has slightly more calories than Lily's. It's helpful to compare the Calories per gram because of differences in serving sizes. We've calculated these amounts in the 3rd column of the Results table. You'll see that for bars and chips this ranges from to 4.3 to 6.5 Cal/g, while, for cocoa powders it is 1.7 to 5.1 Cal/g, while for nibs it is 4.6 to 6.3 Cal/g.

Caffeine and Theobromine

Note that that cocoa-based products will contain some caffeine — although typically less than in a cup of coffee (about 100 mg). A 40-gram serving of dark chocolate will generally contain about 25 to 85 mg of caffeine (see amounts listed in the 3rd column of the Results table), although most contain about 1 mg of caffeine per gram of chocolate. We didn't test other products for caffeine in 2019 unless an amount was claimed, but did from 2020 and after. A tablespoon of cocoa will contain about 10 to 20 mg of caffeine, supplements will contain about 1 mg to 30 mg of caffeine, and 30 grams of nibs may contain 45 to 85 mg of caffeine.

Theobromine, which is bitter and can cause some side effects, is also found in cocoa-based products. We measured amounts in all dark chocolate bars, which ranged from 51.4 mg to over 600 mg per serving, and in supplements, which ranged from about 15 mg to 155 mg. These amounts are also listed in the 4th column of the Results table for products tested in 2020 and after. Based on past testing, cocoa powders contain about 100 to 120 mg of theobromine per tablespoon (but can be much less if Dutched) and nibs contain about 300 mg per three tablespoon serving. In general, we've found that products higher in theobromine are also higher in caffeine.

Read about potential side-effects of caffeine and theobromine in the Concerns and Cautions section.

Top Picks:

In choosing its *Top Picks* among the products "Approved" for quality in this Review, ConsumerLab.com looked for those with a high flavanol content and the lowest possible contamination, while also considering price and taste.

Overall Top Pick for Cocoa Flavanols

If you are just after flavanols, you'll generally get the most flavanols with the least heavy metal contamination and calories from supplements made from cocoa extracts and, among these, the product with one of the highest concentrations of flavanols is ***CocoaVia Brain Health Memory+*** *capsules*. It promises 750 mg of flavanols in a daily serving of 3 capsules (for $1.50), and we found an even greater amount of flavanols (993.1 mg). This is a reasonable cost for flavanols, with each 200 mg of flavanols costing 40 cents (or just 27 to 30 cents based on the amounts found), which is comparable to the cost of 200 mg of flavanols from dark chocolate bars but higher than cocoa powders high in flavanols. *CocoaVia's Heart & Brain* supplement had a slightly higher concentration of flavanols than its *Brain Health* supplement, but it cost a few cents more per capsule and both promise the same amount of flavanols per capsule (250 mg).

Dark Chocolates

Unsweetened **dark chocolate**

If you love *strong dark chocolate, don't need it to be sweet*, want plenty of flavanols and minimal cadmium contamination, the clear winner, and a *Top Pick* for dark chocolates, is ***Montezuma's Dark Chocolate Absolute Black — 100% Cocoa***. We found that each gram contains 14 mg of flavanols — the *highest* of any bar we tested -- and just 0.06 mcg of cadmium, which was one of the lowest levels.

Montezuma's, which is from England, is a bit pricey, currently at $4.77 per 90-gram bar (which has shrunk from 100 grams in 2019), but, in terms of getting flavanols, it's among the lowest cost bars, at 77 cents per 200 g of flavanols.

Sweetened Dark Chocolate

For people who like *dark chocolate that's a little sweet*, our *Top Pick* ***Ghirardelli Intense Dark 72% Cacao***, as it has the 2nd highest concentration of flavanols (12.7 mg/g), which is even higher than from some bars claiming 85%, 99%, or even 100% cacao or cocoa. *Ghirardelli* is relatively low in cadmium (0.11 mcg/g) and moderately priced at $3.39 per 100-gram bar. *Ghirardelli* tops our previous *Top Pick* in this category, which was *Trader Joe's Pound Plus — 72% Cacao Dark Chocolate*, which has less than half the flavanols as *Ghirardelli* (although also 1/3 less cadmium). *Trader Joe's Pound Plus* does, however, beat *Ghirardelli* in terms of getting flavanols at lowest cost because the *Pound Plus* (500-gram) bar is *5 times* the size of *Ghirardelli's* but costs only $1 more, making the cost to get 200 mg of flavanols only 39 cents from *Trader Joe's* versus 86 cents from *Ghirardelli*. On the other hand, you'd have to eat more than twice as much chocolate to get those flavanols from *Trader Joe's*, which means more than twice as many calories and more cadmium compared to *Ghirardelli*.

[**(Update: 4/17/25)**: A CL member informed us that tests of *Ghirardelli Intense Dark 72% Cacao* by an independent group, PlasticList, found 4,480 ng (nanograms) of DEHP per 32-gram serving of this dark chocolate in 2024. DEHP is a collection of plasticizer compounds that are endocrine disruptors with reproductive and probable carcinogenic effects. The amount found in *Ghirardelli*, however, is much lower than the daily limits established by the US EPA (1,400,000 ng) and in Europe (3,500,000 ng) based on a lifetime of exposure for a typical adult (154 lbs) to avoid appreciable risk. *Ghirardelli* had no detectable BPA, another toxic plasticizer. More than 300 foods were tested (although no other chocolates), with the highest amounts of DEHP found in a blueberry protein bar from *RxBAR* (31,200 ng) and a chicken salad from *Sweetgreen* (30,415 ng). Tests of several supplements showed the highest amount to be in the greens supplements *AG1* (19,218.8 ng per 12 gram serving) and *One-A-Day Prenatal 1* (10,800 ng per softgel). A can of an albacore tuna contained 15,052 ng.]

One reason why you can't rely on the "% cacao" as an indicator of flavanol content is that the confectionery industry has defined this as the sum of the cocoa liquor, cocoa powder, and cocoa butter in the formulation — and cocoa butter does not contain flavanols. Products claiming a high "% cacao" but which CL found to be relatively low in flavanols likely contain relatively high concentrations of cocoa butter.

Keep in mind that, due to added cocoa butter (which has twice the calories of sugar) and sugar itself, *dark chocolate bars have more calories than cocoa powder*, so, to get 200 mg of flavanols, you will consume about 100 to 250 or more Calories from a bar versus only about 30 calories from a (non-Dutched) powder.

If you want dark chocolate that is sweetened *without sugar*, our *Top Pick* is ***Lily's Sea Salt Extra Dark - 70% Cocoa***, which is sweetened with erythritol and stevia. A bar costs $3.79, such that each 30 gram (40% of a bar) serving costs about $1.52, has 130 Calories, a good amount of flavanols (176 mg or 5.9 mg/g). The other product with non-sugar sweeteners is *Choc Zero - 70% Cocoa*, which uses monk fruit as a sweetener. It costs about the same per gram of chocolate as *Lily's* but provides a somewhat lower amount of flavanols. Both products are low in cadmium. *Lily's* achieves a flavor similar to bars sweetened with sugar, while *Choc Zero* has a mild fruitiness from its monk fruit. If you are avoiding sodium, be aware that this particular *Lily's* bar includes a modest amount of salt (65 mg of sodium per 30 gram serving), while *Choc Zero* has none. Also, there is concern that high intake of erythritol (30 grams) may promote clotting and increase the risk of stroke or other cardiovascular events. *Lily's* contains erythritol (5 grams per serving), but this amount, in itself, is not known to pose a safety concern.

Chocolate Chips

Our *Top Pick* among dark chocolate chips is ***Guittard Extra Dark Chocolate Baking Chips — 63% Cacao*** because these chips provide 146% more flavanols *per gram* than *Ghirardelli Chocolate Premium Baking Chips — 60% Cacao* (9.6 mg vs. 3.9 mg) and cost less (20 cents vs. 25 cents per 15 gram serving). However, *Guittard* contains a bit more cadmium per gram (0.23 mcg vs. 0.18 mcg), making a 15-gram serving exceed the limit in Canada for children, but not for adults. For children, the *Ghirardelli* chips may be preferable. (Note that the *Ghirardelli* chips are about twice the size of the *Guittard* chips due a much wider base.)

Cocoa Powders

***100%* Cocoa Powders (Unsweetened)**

After years of testing, we've finally found a cocoa powder that is high in flavanols and low in cadmium and lead. It is ***Good & Gather (Target) Unsweetened Cocoa Powder (100% Cocoa Powder)*** and it is our *Top Pick* for cocoa powder.

Among cocoa powders, *Good & Gather* had the highest concentration of cocoa flavanols (18.4 mg/g) and one of lowest concentrations of cadmium (0.11 mcg/g) as well as very little lead (0.06 mcg/g). This is a significant improvement over our last *Top Pick*, which was *Ghirardelli Chocolate Premium Baking Cocoa — 100% Cocoa*, which had only 1/3 the flavanols and about the same amount of cadmium (although a bit more lead).

It's important to pick cocoa powder carefully, as some, like *Hershey's Cocoa Special Dark*, provide only a small amount of flavanols and high amounts of cadmium. As with bars, products that have been Dutched (processed with alkali), like *Hershey's*, as well as *365* and *Valrhona*, and tend to have low flavanol levels but have a smoother flavor and a darker color.

Good & Gather costs only $1.99 per 8 oz (226 g) container, which means that you can get 200 mg of flavanols for just 10 cents from a little more than 2 tablespoons of powder. You would have to spend several times that to get the same amount of flavanols from other products — and over $2 to get it from *Hershey's Cocoa Special Dark*.

If you want even more flavanols than in *Good & Gather*, consider a supplement like *CocoaVia* which, in addition to capsules, has a powder (*CocoaVia Cardio Health — Dark Chocolate Flavor Mix*) that gets mixed with water like regular cocoa powder to make a chocolatey drink that is extremely high in cocoa flavanols (several times the concentration in natural cocoa powder) and very low in cadmium and lead.

Hot Cocoa *Mixes*

Mixes contain cocoa powder along with many other ingredients, particularly sweeteners, so you'll be getting about 80 to 90 Calories per serving instead of about 10 Calories from a tablespoon of cocoa powder. If you want a decent amount of flavanols, our *Top Pick* among the mixes is ***Ghirardelli Double Chocolate Hot Cocoa Mix*** (37 cents per 2 tbsp serving), as it has nearly four-times the flavanols as *Nestle Hot Cocoa Mix* (13 cents per packet). However, if you are giving a cocoa mix to children, you may want to opt for *Nestle* because it has less lead than *Ghirardelli*, as discussed earlier.

Cacao Nibs

Unfortunately, both brands of nibs (bits of broken, roasted cocoa bean) tested by CL were Not Approved due to cadmium contamination. However, the *best option* among them is ***Navitas Naturals Cacao Nibs*** because it had the highest concentration of flavanols — a whopping 677.1 mg per 3 tablespoons (30 grams), which was even more than its listed amount of 480 mg -- and the lowest concentration of cadmium. Although the suggested 3-tablespoon serving size would put you at more than double the daily adult limit for cadmium, if you wanted just 200 mg of flavanols, you could eat a little less than one tablespoon per day and stay below the daily cadmium limit. Keep in mind that although nibs don't have sugar, about half their weight is fat, so they are not low in calories, and most of the fat is saturated fat. [**Note:** Navitas was tested in 2019 and listed Peru as the source for its nibs. Source of nibs is no longer listed, stating only "Fair Trade." Quality may be different from 2019.]

Cocoa Supplements

For the same reasons that made it our "Overall" *Top Pick* for getting flavanols, ***CocoaVia Brain Health Memory+*** capsules is our *Top Picks* among supplements. A 3-capsule serving provides at least 750 mg of flavanols (we found 993.1 mg). Although it is reasonably priced against cocoa and dark chocolate products in terms of getting flavanols, the daily cost of 3 capsules is significant -- $1.50.

If you prefer a mix rather than capsules, our recommendation would be *CocoaVia Cardio Health - Dark Chocolate Flavor Mix*, which is a powder that comes in packets that list 500 mg of flavanols (we found 679 mg). It is a good option for someone who wants to enjoy a chocolatey drink providing hundreds of milligrams of cocoa flavanols with little cadmium.

Be aware that some cocoa supplements contain little or no flavanols. We found that *Nootropics Depot Chocamine Extract* provided only 2.4 mg of flavanols per 1 gram serving. Similarly, in 2019 we found *Hawaii Pharm Cacao* (a liquid) to contain only a tiny amount of flavanols and our 2014 tests showed *NuNaturals Pure Liquid™ Cocoa Bean Extract* to contain virtually no flavanols.

Test Results by Product:

Listed alphabetically below are the test results for 41 cocoa/cacao-based products. Thirty-seven were selected by ConsumerLab.com and four supplements (each indicated with a CL flask) are included for having passed the same evaluation through ConsumerLab.com's voluntary Quality Certification Program.

Products listed as "Approved" contained the cocoa-related compounds based on their label claims and expected minimum amounts and met requirements regarding heavy metals and proper labeling (see Passing Score). Flavanol and heavy metals amounts found are shown in the 2nd column. In the 3rd column are the amounts of caffeine and theobromine amounts found, listed calories, taste impressions, and information about whether a product was Dutched (alkali processed). Price comparisons are in the 4th column. Sources of cocoa (if listed on label) are in the 5th column along with other notable features. The full list of ingredients is available for each product in the last column.

Results of ConsumerLab.com Testing of Cocoa Products

(Price Checks are not included in printed reviews)

Approval Status **Year Published** **Product Name**	**Listed Serving Size** **Flavanols & Heavy Metals Found Per Serving**	**Caffeine & Theobromine Found Per Serving** **Calories [Claimed]** ***Taste***	**Cost Per Suggested Serving** **[Cost Per 200 mg Flavanols *Found*]** **Price**	**Cacao/Cocoa Source** **Notable Features**	**Full List of Ingredients Per Serving**
Dark Chocolate (Bars or Pieces):					

NOT APPROVED **2019** Alter Eco® Deep Dark Blackout - 85% Cocoa  Dist. by Alter Eco Foods	5 sections [40 g] Flavanols: 221.5 mg (**5.5 mg/g**) Cadmium: 14.1 mcg (**0.35 mcg/g**) Lead: 1.1 mcg (**0.03 mcg/g**) Arsenic: <2 mcg (**<0.05 mcg/g**)	Caffeine: 50 mg Theobromine: 375.6 mg Calories: 260 [6.5 Cal/g] *Bittersweet, earthy chocolate flavor*	$3.43/5 sections **[$3.09]** $27.40/four 2.82 oz [80 g] bars (approx. 8 servings) $6.85/bar *2019 price: $44.28/twelve 2.82 oz [80 g] bar*	Source: Ecuador *Non GMO Project Verified seal. International Fairtrade Certification seal. Vegan. Gluten-Free.* **Precaution:** May contain milk, hazelnuts, almonds, coconut, and soy.	5 sections Calories 260, Calories from Fat 200, Total Fat 22 g, Saturated Fat 13 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 11 g, Dietary Fiber 5 g, Sugars 6 g, Protein 4 g Additional Information 5 sections Calories 260, Calories from Fat 200, Total Fat 22 g, Saturated Fat 13 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 11 g, Dietary Fiber 5 g, Sugars 6 g, Protein 4 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 2%, Iron 2%. Ingredients: Organic cacao beans, organic cocoa butter, organic raw cane sugar, organic vanilla beans.

APPROVED **2022** Baker's Semi-Sweet Chocolate - 56% Cacao  Dist. by Kraft Heinz Foods	2 pieces [14 g] Flavanols: 74 mg (**5.3 mg/g**) Cadmium: 0.91 mcg (**0.07 mcg/g**) Lead: 0.2 mcg (**0.01 mcg/g**) Arsenic: 1.1 mcg (**0.08 mcg/g**)	Caffeine: 9.8 mg Theobromine: 82.6 mg Calories: 70 [5 Cal/g] *Mild dark chocolate flavor, very sweet (6 g of sugar per 14 g)*	$0.43/2 pieces **[$1.17]** $3.49/4 oz [113 g] bar (approx. 8 servings)	Source: Not listed *Kosher.* **Precaution:** Contains: Soy. May Contain: Milk.	2 pieces Calories 70, Total Fat 5 g, Saturated Fat 3 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 8 g, Dietary Fiber, Total Sugars [Includes 6 g Added Sugars] 6 g, Protein less than 1 g, Vit. D 0 mcg, Calcium 0 mg, Iron 1.4 mg Additional Information 2 pieces Calories 70, Total Fat 5 g, Saturated Fat 3 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 8 g, Dietary Fiber, Total Sugars [Includes 6 g Added Sugars] 6 g, Protein less than 1 g, Vit. D 0 mcg, Calcium 0 mg, Iron 1.4 mg, Potas. 0 mg. Ingredients: Semi-Sweet Chocolate (Chocolate, Sugar, Cocoa Butter, Soy, Lecithin [Emulsifier], Vanilla Extract).

APPROVED **2019** Baker's Unsweetened - 100% Cacao  Dist. by Kraft Heinz Foods	2 pieces [14 g] Flavanols: 109.8 mg (**8.5 mg/g**) Cadmium: 2.9 mcg (**0.21 mcg/g**) Lead: 0.42 mcg (**0.03 mcg/g**) Arsenic: <0.7 mcg (**<0.05 mcg/g**)	Caffeine: 18.3 mg Theobromine: 171.6 mg Calories: 70 [5 Cal/g] *Slightly bitter, rich chocolate flavor*	$0.34/2 pieces **[$0.61]** $2.69/4 oz [113 g] bar (approx. 8 servings) *2019 price: $2.79/4 oz [113 g] bar*	Source: Not listed *Kosher.* **Precaution:** May Contain: Milk.	2 pieces Calories 70, Total Fat 7 g, Saturated Fat 4.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 4 g, Dietary Fiber 3 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 2 g, Vit. D 0 mcg, Calcium 0 mg, Iron 2.8 mg Additional Information 2 pieces Calories 70, Total Fat 7 g, Saturated Fat 4.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 4 g, Dietary Fiber 3 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 2 g, Vit. D 0 mcg, Calcium 0 mg, Iron 2.8 mg, Potas. 150 mg. Ingredients: Chocolate.

APPROVED **2022** Choc Zero Sugar Free 70% Cocoa Dark Chocolate  Dist. by ChoZero, Inc.	1 piece [10 g] Flavanols: 19.9 mg (**2 mg/g**) Cadmium: 0.29 mcg (**0.03 mcg/g**) Lead: 0.3 mcg (**0.03 mcg/g**) Arsenic: <0.17 mcg (**<0.02 mcg/g**)	Caffeine: 5.9 mg Theobromine: 51.4 mg Calories: 45 [4.5 Cal/g] *Moderate dark chocolate flavor, mildly sweet and fruity/nutty (from monk fruit) (zero sugar)*	$0.50/piece **[$5.01]** $4.99/10 pieces	Source: Not listed *Zero Added Sugar.* **Precaution:** Produced in a facility that processes dairy, peanuts, and tree nuts. Not a low calorie food.	1 piece Calories 45, Total Fat 4 g, Saturated Fat 2 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 5 g, Dietary Fiber 4 g, Total Sugar [Includes 0 g Added Sugar] 0 g, Protein 0 g, Vitamin D 0 mcg, Calcium 3 mg, Iron 0 mg, Potassium 29 mg Additional Information 1 piece Calories 45, Total Fat 4 g, Saturated Fat 2 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 5 g, Dietary Fiber 4 g, Total Sugar [Includes 0 g Added Sugar] 0 g, Protein 0 g, Vitamin D 0 mcg, Calcium 3 mg, Iron 0 mg, Potassium 29 mg. Ingredients: Dark chocolate (unsweetened chocolate, cocoa butter), Non-GMO resistant dextrin, sunflower lecithin, monk fruit extract, Madagascar bourbon vanilla beans.

APPROVED 2019 Chocolove Strong Dark Chocolate - 70% Cocoa Content  Dist. by Chocolove	1/3 bar [30 g] Flavanols: 145.8 mg (**4.9 mg/g**) Cadmium: 2.7 mcg (**0.09 mcg/g**) Lead: <0.75 mcg (**<0.03 mcg/g**) Arsenic: <1.5 mcg (**<0.05 mcg/g**)	Caffeine: 31.8 mg Theobromine: 304.5 mg Calories: 160 [5.3 Cal/g] *Sweet, fairly smooth flavor, slightly waxy*	$1.10 per 1/3 bar **[$1.51]** $3.30/3.2 oz [90 g] bar (approx. 3 servings) *2019 price: $2.36/3.2 oz [90 g] bar*	Source: African and Caribbean *Non GMO Project Verified seal. Kosher. Rainforest Alliance Certified seal.* **Precaution:** Contains Soy. May Contain Traces Of Milk, Wheat, Peanuts Or Other Nuts.	1/3 bar Calories 160, Fat Cal. 110, Total Fat 13 g, Sat Fat 8 g, Trans Fat 0 g, Cholest. 0 mg, Sodium 0 mg, Total Carb. 14 g, Fiber 3 g, Sugars 9 g, Protein 2 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 2%, Iron 30%. Ingredients: Cocoa Liquor Additional Information 1/3 bar Calories 160, Fat Cal. 110, Total Fat 13 g, Sat Fat 8 g, Trans Fat 0 g, Cholest. 0 mg, Sodium 0 mg, Total Carb. 14 g, Fiber 3 g, Sugars 9 g, Protein 2 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 2%, Iron 30%. Ingredients: Cocoa Liquor, Sugar, Cocoa Butter, Soy Lecithin, Vanilla.

APPROVED 2019 Endangered Species™ Chocolate Strong + Velvety Dark Chocolate - 88% Cocoa  Dist. by Endangered Species Chocolate, LLC	1/3 bar [28 g] Flavanols: 157.9 mg (**5.6 mg/g**) Cadmium: 1.5 mcg (**0.05 mcg/g**) Lead: <0.7 mcg (**<0.03 mcg/g**) Arsenic: <1.4 mcg (**<0.05 mcg/g**)	Caffeine: 32.5 mg Theobromine: 321.2 mg Calories: 180 [6.4 Cal/g] *Bittersweet*	$1.05 per 1/3 bar **[$1.33]** $3.14/3 oz [85 g] bar (approx. 3 serving) *2019 price: $3.49/3 oz [85 g] bar*	Source: Not listed *Non GMO Project Verified seal. International Fairtrade Certification seal. Kosher. Certified Vegan Vegan.org seal. Gluten-Free.* **Precaution:** Allergens: Contains Soy. Produced On Equipment That Also Processes Products Containing Milk Additional Information Source: Not listed *Non GMO Project Verified seal. International Fairtrade Certification seal. Kosher. Certified Vegan Vegan.org seal. Gluten-Free.* **Precaution:** Allergens: Contains Soy. Produced On Equipment That Also Processes Products Containing Milk, Peanuts And Tree Nuts.	1/3 bar [28 g] Calories 180, Total Fat 13 g, Sat. Fat 8 g, Trans Fat 0 g, Cholest. 0 mg, Sodium 0 mg, Total Carb. 11 g, Total Sugars [Incl. 3 g Added Sugars] 3 g, Protein 3 g, Vitamin D 0 mcg, Calcium 0 mg, Iron 1.5 mg, Potassium 260 mg. Ingredients: Bittersweet Chocolate Additional Information 1/3 bar [28 g] Calories 180, Total Fat 13 g, Sat. Fat 8 g, Trans Fat 0 g, Cholest. 0 mg, Sodium 0 mg, Total Carb. 11 g, Total Sugars [Incl. 3 g Added Sugars] 3 g, Protein 3 g, Vitamin D 0 mcg, Calcium 0 mg, Iron 1.5 mg, Potassium 260 mg. Ingredients: Bittersweet Chocolate (Chocolate Liquor, Sugar, Soy Lecithin, Vanilla).

NOT APPROVED **2022** Evolved® Midnight Coconut 100% Cacao Chocolate Bar  Dist. by Eating Evolved®	3/7 bar [28 g] Flavanols: 209.4 mg (**7.5 mg/g**) Cadmium: 7.7 mcg (**0.27 mcg/g**) Lead: 1.1 mcg (**0.04 mcg/g**) Arsenic: 1 mcg (**0.04 mcg/g**)	Caffeine: 33.9 mg Theobromine: 282.8 mg Calories: 160 [5.7 Cal/g] *Bitter dark chocolate flavor, not sweet, with small bits of coconut but very little coconut flavor (zero sugar; no sweeteners)*	$2.10 per 3/7 bar **[$2.01]** $39.00/eight 2.3 oz [65 g] bars (approx. 18.4 servings) $4.88/bar	Source: Not listed *Rainforest Alliance People & Nature seal. USDA Organic seal. Keto. Vegan. Paleo. No Sugar Added.* **Precaution:** Contains: Coconut. May Contain Traces of Almonds, Cashews, Hazelnuts Additional Information Source: Not listed *Rainforest Alliance People & Nature seal. USDA Organic seal. Keto. Vegan. Paleo. No Sugar Added.* **Precaution:** Contains: Coconut. May Contain Traces of Almonds, Cashews, Hazelnuts, Macadamia Nuts, Sesame And Walnuts. Not a low calorie food.	3/7 bar Calories 160, Total Fat 17 g, Saturated Fat 11 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 5 mg, Total Carbohydrate 7 g, Dietary Fiber 4 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 3 g, Vitamin D 0.6 mcg, Calcium 17.5 mg, Iron 2.5 mg Additional Information 3/7 bar Calories 160, Total Fat 17 g, Saturated Fat 11 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 5 mg, Total Carbohydrate 7 g, Dietary Fiber 4 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 3 g, Vitamin D 0.6 mcg, Calcium 17.5 mg, Iron 2.5 mg, Potassium 190 mg. Ingredients: Organic Cacao, Organic Coconut, Organic Cacao Butter.

APPROVED **2022** Top Pick for Sweetened Dark Chocolate Bars Ghirardelli® Intense Dark 72% Cacao Dark Chocolate  Mfd. by Ghirardelli Chocolate Company	2 pieces [25 g] Flavanols: 318.5 mg (**12.7 mg/g**) Cadmium: 2.7 mcg (**0.11 mcg/g**) Lead: <0.23 mcg (**<0.01 mcg/g**) Arsenic: 0.7 mcg (**0.03 mcg/g**)	Caffeine: 20.1 mg Theobromine: 157 mg Calories: 130 [5.2 Cal/g] *Moderate dark chocolate flavor and moderate sweetness (7 g of sugar per 25 g)*	$0.85/2 pieces **[$0.54]** $3.39/3.5 oz [100 g] bar (approx. 4 servings)	Source: Not listed *Kosher.* **Precaution:** May contain milk and tree nuts.	2 pieces Calories 130, Total Fat 11 g, Saturated Fat 7 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 11 g, Dietary Fiber 3 g, Total Sugars [Includes 6 g Added Sugars] 7 g, Protein 2 g, Vit. D 0 mcg, Calcium 10 mg, Iron 0.9 mg, Potas. 150 mg. Ingredients: Unsweetened chocolate Additional Information 2 pieces Calories 130, Total Fat 11 g, Saturated Fat 7 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 11 g, Dietary Fiber 3 g, Total Sugars [Includes 6 g Added Sugars] 7 g, Protein 2 g, Vit. D 0 mcg, Calcium 10 mg, Iron 0.9 mg, Potas. 150 mg. Ingredients: Unsweetened chocolate, cane sugar, cocoa butter, vanilla extract, soy lecithin.

NOT APPROVED **2022** Green & Black's Organic Dark Chocolate - Dark 85% Cacao  Dist. by Mondelez Global LLC	10 pieces [30 g] Flavanols: 198.2 mg (**6.6 mg/g**) Cadmium: 7.2 mcg (**0.24 mcg/g**) Lead: 0.57 mcg (**0.02 mcg/g**) Arsenic: 0.78 mcg (**0.03 mcg/g**)	Caffeine: 40.5 mg Theobromine: 274.5 mg Calories: 190 [6.3 Cal/g] *Intense dark chocolate flavor with slight sweetness (4 g of sugar per 30 g)*	$1.16/10 pieces **[$1.17]** $34.80/ten 3.17 oz [90 g] bars (approx. 30 servings) $3.48/bar	Source: Not listed *USDA Organic seal. Non GMO Projected Verified seal. Fairtrade® seal. Suitable For Vegetarians. Certified Organic By California Certified Organic Farmers (CCOF).* **Precaution:** May Contain: Milk, Tree Nuts.	10 pieces Calories 190, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 15 mg, Total Carbohydrate 11 g, Dietary Fiber 4 g, Total Sugars [Incl Added Sugars 4 g] 4 g, Protein 3 g, Vitamin D 0.4 mcg, Calcium 20 mg, Iron 3.6 mg, Potassium 230 mg Additional Information 10 pieces Calories 190, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 15 mg, Total Carbohydrate 11 g, Dietary Fiber 4 g, Total Sugars [Incl Added Sugars 4 g] 4 g, Protein 3 g, Vitamin D 0.4 mcg, Calcium 20 mg, Iron 3.6 mg, Potassium 230 mg. Ingredients: Organic Bittersweet Chocolate (Organic Chocolate Liquor, Organic Cocoa Butter, Organic Cane Sugar, Organic Vanilla Extract).

APPROVED **2022** Hu Salty Dark Chocolate - 70% Cocoa  Dist. by Hu Products LLC	1/2 bar [30 g] Flavanols: 124.2 mg (**4.1 mg/g**) Cadmium: 2.3 mcg (**0.08 mcg/g**) Lead: 0.81 mcg (**0.03 mcg/g**) Arsenic: 0.93 mcg (**0.03 mcg/g**)	Caffeine: 18 mg Theobromine: 192 mg Calories: 190 [6.3 Cal/g] *Mild dark chocolate flavor, moderately salty and sweet (7 g sugar per 30 g)*	$2.65 per 1/2 bar **[$4.26]** $21.16/four 2.1 oz [60 g] bars (approx. 8 servings) $5.29/bar	Source: Not listed *USDA Organic seal. Fairtrade® seal. Certified Vegan Vegan.org seal. Non GMO Project Verified seal. Certified Paleo. Gluten Free. No Sugar Alcohols, No Erythritol.* **Precaution:** Allergy Statement: Contains coconut Additional Information Source: Not listed *USDA Organic seal. Fairtrade® seal. Certified Vegan Vegan.org seal. Non GMO Project Verified seal. Certified Paleo. Gluten Free. No Sugar Alcohols, No Erythritol.* **Precaution:** Allergy Statement: Contains coconut. May contain almond, cashew, hazelnut, pistachio & dairy. Allergens cleans made prior to production, but beware that product is produced using equipment that also processed tree nuts, soy, dairy & wheat.	1/2 bar Calories 190, Total Fat 14 g, Saturated Fat 8 g, Sodium 100 mg, Total Carbohydrate 14 g, Dietary Fiber 3 g, Total Sugars [Includes 6 g Added Sugars] 7 g, Protein, Vit. D 0.5 mcg, Calcium 21 mg, Iron 3 mg, Potas. 260 mg Additional Information 1/2 bar Calories 190, Total Fat 14 g, Saturated Fat 8 g, Sodium 100 mg, Total Carbohydrate 14 g, Dietary Fiber 3 g, Total Sugars [Includes 6 g Added Sugars] 7 g, Protein, Vit. D 0.5 mcg, Calcium 21 mg, Iron 3 mg, Potas. 260 mg. Ingredients: Organic cacao, organic unrefined coconut sugar, organic cocoa butter, sea salt.

APPROVED **2022** Top Pick for Sweetened Without Sugar Dark Chocolate Bars Lily's® Sea Salt - Extra Dark Chocolate - 70% Cocoa  Dist. by Lily's Sweets LLC	2/5 bar [30 g] Flavanols: 176 mg (**5.9 mg/g**) Cadmium: 1.1 mcg (**0.04 mcg/g**) Lead: 0.6 mcg (**0.02 mcg/g**) Arsenic: <0.6 mcg (**<0.02 mcg/g**)	Caffeine: 25.5 mg Theobromine: 212.7 mg Calories: 130 [4.3 Cal/g] *Moderate dark chocolate flavor, with slightly salty with an earthy tone (possibly from chicory) (zero sugar; sweetened with erythritol and stevia, but no aftertaste)*	$1.52 per 2/5 bar **[$1.72]** $45.48/twelve 2.8 oz [80 g] bars (approx. 30 servings) $3.79/bar	Source: Not listed *USDA Organic seal. Fairtrade® seal. No Sugar Added. Certified Gluten-Free. Kosher.* **Precaution:** Allergy Information: Produced On Equipment That Also Processes Product Containing Milk, Peanuts, Soy And Tree Nuts. Not a low calorie food.	2/5 bar Calories 130, Total Fat 12 g, Saturated Fat 7 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 65 mg, Total Carb. 14 g, Dietary Fiber 8 g, Total Sugars [Incl. Added Sugars 0 g] 0 g, Erythritol 5 g, Protein 3 g, Vitamin D 0 mcg, Calcium 15 mg, Iron 3.5 mg, Potassium 210 mg. Ingredients: Unsweetened Chocolate, Erythritol Additional Information 2/5 bar Calories 130, Total Fat 12 g, Saturated Fat 7 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 65 mg, Total Carb. 14 g, Dietary Fiber 8 g, Total Sugars [Incl. Added Sugars 0 g] 0 g, Erythritol 5 g, Protein 3 g, Vitamin D 0 mcg, Calcium 15 mg, Iron 3.5 mg, Potassium 210 mg. Ingredients: Unsweetened Chocolate, Erythritol, Chicory Root Fiber, Cocoa Butter, Sea Salt, Sunflower Lecithin, Vanilla Extract, Stevia Extract.

NOT APPROVED 2019 Lindt Excellence Supreme Dark - 90% Cocoa  Mfd. by Lindt & Sprungli (USA) Inc.	4 squares [40 g] Flavanols: 147.5 mg (**3.7 mg/g**) Cadmium: 5.8 mcg (**0.15 mcg/g**) Lead: <1 mcg (**<0.03 mcg/g**) Arsenic: <2 (**<0.05 mcg/g**)	Caffeine: 42.4 mg Theobromine: 474 mg Calories: 240 [6 Cal/g] *Slightly sweet, mild chocolate flavor, waxy* Note: Dutched - alkali processed	$1.20/4 squares **[$1.62]** $2.99/3.5 oz [100 g] bar (approx. 2.5 servings) *2019 price: $4.19/3.5 oz [100 g] bar*	Source: Not listed **Precaution:** May contain traces of peanuts/ soybeans/ tree nuts/ milk.	4 squares Calories 240, Calories from Fat 190, Total Fat 22 g, Saturated Fat 13 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 10 mg, Total Carbohydrate 12 g, Dietary Fiber 5 g, Sugars 3 g, Protein 4 g, Percent of recommended daily intake: Vitamin A 0% Additional Information 4 squares Calories 240, Calories from Fat 190, Total Fat 22 g, Saturated Fat 13 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 10 mg, Total Carbohydrate 12 g, Dietary Fiber 5 g, Sugars 3 g, Protein 4 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 4%, Iron 15%. Ingredients: Chocolate, cocoa butter, cocoa powder processed with alkali, sugar, bourbon vanilla beans.
APPROVED 2019 Montezuma's® Dark Chocolate Absolute Black - 100% Cocoa  Mfd. by Montezuma's Chocolates	1/4 bar [25 g] Flavanols: 350.5 mg (**14 mg/g**) Cadmium: 1.4 mcg (**0.06 mcg/g**) Lead: 0.93 mcg (**0.04 mcg/g**) Arsenic: <1.2 mcg (**<0.05 mcg/g**)	Caffeine: 85.3 mg Theobromine: 604.5 mg Calories: 150 [6 Cal/g] *Strong chocolate flavor, slightly bitter*	$1.19 per 1/4 bar **[$0.68]** $28.60/six 90 g bars (approx. 24 servings) $4.77/bar *2019 price: $25.82/six 100 g bar*	Source: Not listed *Vegan. Free From Gluten, Soya, Colourings, Preservatives & GM.* **Precaution:** May Contain Traces Of Dairy, Nuts, Peanuts & Sesame Seeds.	1/4 bar Energy 160 kcal, Fat [of which: saturates 8 g] 13 g, Carbohydrates [of which: Sugars <0.1 g] 2 g, Protein 3 g, Fibre 4 g, Salt <0.01 g. Ingredients: Dark Chocolate (Cocoa Mass 100%).

NOT APPROVED **2019** Scharffen Berger® Unsweetened - 99% Cacao  Mfd. by Scharffen Berger Chocolate Maker	1 block [55 g] Flavanols: 305.9 mg (**5.6 mg/g**) Cadmium: 12.1 mcg (**0.22 mcg/g**) Lead: <1.4 mcg (**<0.03 mcg/g**) Arsenic: <2.7 mcg (**<0.05 mcg/g**)	Caffeine: 79.2 mg Theobromine: 628.7 mg Calories: 280 [5.1 Cal/g] claimed *Bitter, earthy chocolate flavor* Note: Large, thick, block for baking	$2.44/block **[$1.59]** $24.35/two 9.7 oz [275 g] bars (approx. 10 servings) $12.18/bar *2019 price: $9.58/9.7 oz [275 g] bar*	Source: Not listed *Kosher.*	1 block Calories 280, Calories from Fat 250, Total Fat 30 g, Sat. Fat 19 g, Trans Fat 0 g, Cholest. 0 mg, Sodium 5 mg, Total Carb. 14 g, Dietary Fiber 9 g, Sugars <1 g, Protein 8 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 2%, Iron 20% Additional Information 1 block Calories 280, Calories from Fat 250, Total Fat 30 g, Sat. Fat 19 g, Trans Fat 0 g, Cholest. 0 mg, Sodium 5 mg, Total Carb. 14 g, Dietary Fiber 9 g, Sugars <1 g, Protein 8 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 2%, Iron 20%. Ingredients: Cacao Beans; Whole Vanilla Beans.

NOT APPROVED 2019 Taza Chocolate® Wicked Dark® - 95% Dark  Mfd. by Taza Chocolate	1/2 bar [35 g] Flavanols: 192.5 mg (**5.5 mg/g**) Cadmium: 6.8 mcg (**0.19 mcg/g**) Lead: <0.88 mcg (**<0.03 mcg/g**) Arsenic: <1.7 mcg (**0.05 mcg/g**)	Caffeine: 67.2 mg Theobromine: 414.4 mg Calories: 210 [6 Cal/g] *Mildly sweet, earthy chocolate flavor, slightly grainy*	$4.50 per 1/2 bar **[$4.67]** $8.99/2.5 oz [70 g] bar (approx. 2 servings) *2019 price: $3.37/2.5 oz [70 g] bar*	Source: Not listed *USDA Organic seal. Non GMO Project Verified seal. Gluten Free. Dairy Free. Soy Free. Vegan. Kosher.* **Precaution:** Contains traces of almonds, cashews, coconut, hazelnuts and pecans.	1/2 bar Calories 120, Total Fat 14 g, Sat Fat 10 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carb. 14 g, Dietary Fiber 8 g, Total Sugars [Incl. 2 g Added Sugars] 2 g, Protein 5g, Percent of recommended daily intake: Vitamin D 0% Additional Information 1/2 bar Calories 120, Total Fat 14 g, Sat Fat 10 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carb. 14 g, Dietary Fiber 8 g, Total Sugars [Incl. 2 g Added Sugars] 2 g, Protein 5g, Percent of recommended daily intake: Vitamin D 0%, Calcium 2%, Iron 6%, Potassium 6%. Ingredients: Organic cacao beans, Organic cane sugar.

NOT APPROVED **2019** Theo Sea Salt - 70% Dark Chocolate  Dist. by Theo Chocolate	1/2 bar [43 g] Flavanols: 172.9 mg (**4 mg/g**) Cadmium: 10.3 mcg (**0.24 mcg/g**) Lead: <1.1 mcg (**<0.03 mcg/g**) Arsenic: <2.1 mcg (**<0.05 mcg/g**)	Caffeine: 52.5 mg Theobromine: 427.4 mg Calories: 210 [4.9 Cal/g] *Mildly sweet and salty, smooth chocolate flavor*	$1.53 per 1/2 bar **[$1.77]** $3.06/3 oz [85 g] bar (approx. 2 servings) *2019 price: $3.46/3 oz [85 g] bar*	Source: Not listed *Non GMO Project Verified seal. USDA Organic seal. Soy Free. Kosher. Fair For Life Fair Trade seal.* **Precaution:** Allergy Information: Manufactured on shared equipment with products containing milk, eggs, wheat, peanuts & tree nuts.	1/2 bar Calories 210, Fat Cal. 150, Total Fat 17 g, Sat. Fat 10 g, Trans Fat 0 g, Cholest. 0 mg, Sodium 150 mg, Total Carb. 20 g, Fiber 4 g, Sugars 13 g, Protein 3 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0% Additional Information 1/2 bar Calories 210, Fat Cal. 150, Total Fat 17 g, Sat. Fat 10 g, Trans Fat 0 g, Cholest. 0 mg, Sodium 150 mg, Total Carb. 20 g, Fiber 4 g, Sugars 13 g, Protein 3 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 0%, Iron 4%. Ingredients: Cocoa Beans, Cane Sugar, Cocoa Butter, Sea Salt, Ground Vanilla Bean.

APPROVED **2019** Trader Joe's® Pound Plus - 72% Cacao Dark Chocolate  Dist. by Trader Joe's	3 squares [38 g] Flavanols: 196.8 mg (**5.2 mg/g**) Cadmium: 2.7 mcg (**0.07 mcg/g**) Lead: 1.2 mcg (**0.03 mcg/g**) Arsenic: <1.9 mcg (**<0.05 mcg/g**)	Caffeine: 47.1 mg Theobromine: 508.4 mg Calories: 230 [6.1 Cal/g] *Sweet, slightly bitter, smooth chocolate flavor*	$0.38/3 squares **[$0.39]** $4.99/17.6 oz [500 g] bar (approx. 13 servings) *2019 price: $4.99/17.6 oz [500g] bar*	Source: Not listed *Kosher.* **Precaution:** Contains Soy. May Contain Traces Of Wheat, Milk, Eggs, Tree Nuts.	3 squares Calories 230, Calories from Fat 130, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 19 g, Dietary Fiber 5 g, Sugars 10 g, Protein 3, Percent of recommended daily intake: Vitamin A 0% Additional Information 3 squares Calories 230, Calories from Fat 130, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 19 g, Dietary Fiber 5 g, Sugars 10 g, Protein 3, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 0%, Iron 40%. Ingredients: Cocoa Mass, Sugar, Cocoa Powder, Soy Lecithin (An Emulsifier).

NOT APPROVED **2022** Trader Joe's® Uganda 85% Dark Chocolate Bar  Dist. by Trader Joe's	3 pieces [30 g] Flavanols: 117.5 mg (**3.9 mg/g**) Cadmium: 7.6 mcg (**0.25 mcg/g**) Lead: 1.9 mcg (**0.06 mcg/g**) Arsenic: <0.6 mcg (**<0.02 mcg/g**)	Caffeine: 31.2 mg Theobromine: 276 mg Calories: 190 [6.3 Cal/g] *Moderate dark chocolate flavor with earthy tone and slight sweetness (4 g of sugar per 30 g)*	$0.51/3 pieces **[$0.86]** $1.69/3.5 oz [100 g] bar (approx. 3.3 servings)	Source: Western Uganda *Kosher.* **Precaution:** May Contain Milk, Soy, Wheat, Almond, Cashew, Coconut, Hazelnut, Pistachio.	3 pieces Calories 190, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 10 g, Dietary Fiber 4 g, Total Sugars [Includes 4 g Added Sugars] 4 g, Protein 3 g, Vit. D 0.6 mcg, Calcium 20 mg, Iron 3.4 mg Additional Information 3 pieces Calories 190, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 10 g, Dietary Fiber 4 g, Total Sugars [Includes 4 g Added Sugars] 4 g, Protein 3 g, Vit. D 0.6 mcg, Calcium 20 mg, Iron 3.4 mg, Potas. 210 mg. Ingredients: Cocoa Mass, Sugar, Cocoa Butter.
Dark Chocolate (Chips):					

APPROVED 2019 Ghirardelli® Chocolate Premium Baking Chips - 60% Cacao Bittersweet Chocolate  Mfd. by Ghirardelli Chocolate Company	16 chips [15 g] (wide, flat shape) Flavanols: 58.5 mg (**3.9 mg/g**) Cadmium: 2.7 mcg (**0.18 mcg/g**) Lead: <0.38 mcg (**<0.03 mcg/g**) Arsenic: <0.75 mcg (**<0.05 mcg/g**)	Was not tested for caffeine and theobromine Calories: 80 [5.3 Cal/g] *Slightly sweet, very slightly bitter, smooth chocolate flavor*	$0.25/16 chips **[$0.64]** $4.79/10 oz [283 g] bag (approx. 19 servings) *2019 price: $4.79/10 oz [283 g] bag*	Source: Not listed *Kosher.* **Precaution:** May contain milk.	16 chips Calories 80, Calories from Fat 50, Total Fat 6 g, Sat Fat 3.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 8 g, Dietary Fiber 1 g, Sugars 6 g, Protein 1 g. Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 0%, Iron 6% Additional Information 16 chips Calories 80, Calories from Fat 50, Total Fat 6 g, Sat Fat 3.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 8 g, Dietary Fiber 1 g, Sugars 6 g, Protein 1 g. Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 0%, Iron 6%. Ingredients: Unsweetened chocolate, sugar, cocoa butter, milk fat, soy lecithin - an emulsifier, vanilla.

APPROVED **for Adults** **2019** Guittard Extra Dark Chocolate Baking Chips - 63% Cacao  Dist. by Guittard Chocolate Company	30 pieces [15 g] (little "kiss-shaped" chips) Flavanols: 143.6 mg (**9.6 mg/g**) Cadmium: 3.4 mcg (**0.23 mcg/g**), which is over the Health Canada limit for children of 3.0 mcg per serving Lead: <0.38 mcg (**<0.03 mcg/g**) Arsenic: <0.56 mcg (**<0.04 mcg/g**)	Was not tested for caffeine and theobromine Calories: 80 [5.3 Cal/g] *Moderately sweet, smooth chocolate flavor*	$0.20/30 pieces **[$0.28]** $4.49/11.5 oz [326 g] bag (approx. 22 servings) *2019 price: $4.49/11.5 oz [326 g] bag*	Source: Not listed *Organic. Made In A Peanut-Free, Tree-Nut Free, & Gluten-Free Manufacturing Facility. International Fairtrade Certification seal. Non GMO Project Verified seal.* **Precaution:** Made On Equipment Also Used To Make Milk Chocolate; Not Suitable For Individuals With Milk Allergies.	30 pieces Calories 80, Total Fat 5 g, Saturated Fat 3 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carb 8 g, Dietary Fiber 3 g, Total Sugars [Including 5 g Added Sugars] 6 g, Protein, Vitamin D 0 mcg, Calcium 10 mg, Iron 2 mg, Potassium 84 mg. Ingredients: Cacao Beans Additional Information 30 pieces Calories 80, Total Fat 5 g, Saturated Fat 3 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carb 8 g, Dietary Fiber 3 g, Total Sugars [Including 5 g Added Sugars] 6 g, Protein, Vitamin D 0 mcg, Calcium 10 mg, Iron 2 mg, Potassium 84 mg. Ingredients: Cacao Beans, Sugar, Sunflower Lecithin And Vanilla.
Cacao/Cocoa Powders:					

APPROVED **2022** **CAUTION: SEE UPDATE** 365 [Whole Foods Market] Organic Cocoa Powder - Unsweetened  Dist. by Whole Foods Market	1 tbsp [6 g] Flavanols: 32.8 mg (**5.5 mg/g**) Cadmium: 2.1 mcg (**0.36 mcg/g**) Lead: 0.33 mcg (**0.06 mcg/g**) Arsenic: 0.22 mcg (**0.04 mcg/g**)	Caffeine: 14.6 mg Theobromine: 137.4 mg Calories: 10 [1.7 Cal/g] *Rich and slightly earthy cocoa flavor - darker color than others* Note: Dutched - alkali processed	$0.22/tbsp **[$1.34]** $8.29/8 oz [227 g] container (approx. 38 servings)	Source: Not listed *Quality Assurance International Certified Organic seal. USDA Organic seal. Fair Trade Certified seal. Non GMO. Vegan.*	1 tbsp Calories 10, Total Fat 0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 3 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 1 g, Vitamin D 0 mcg, Calcium 0 mg, Iron 2.5 mg, Potassium 210 mg Additional Information 1 tbsp Calories 10, Total Fat 0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 3 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 1 g, Vitamin D 0 mcg, Calcium 0 mg, Iron 2.5 mg, Potassium 210 mg. Ingredients: Organic Cocoa Powder (Processed With Alkali).
APPROVED **2019** Ghirardelli® Premium Baking Cocoa - 100% Cocoa  Dist. by Ghirardelli Chocolate Company	1 tbsp [6 g] Flavanols: 36.8 mg (**6.1 mg/g**) Cadmium: 0.62 mcg (**0.1 mcg/g**) Lead: 0.64 mcg (**0.11 mcg/g**) Arsenic: <0.3 mcg (**<0.05 mcg/g**)	Was not tested for caffeine and theobromine Calories: 15 [2.5 Cal/g] *Moderate cocoa flavor, slightly bitter*	$0.14/tbsp **[$0.79]** $32.95/six 8 oz [227 g] bags (approx. 228 servings) $5.49/bag *2019 price: $4.99/8 oz [227 g] bag*	Source: Not listed *Kosher.* **Precaution:** May contains tree nuts, wheat, soy, milk and egg.	1 tbsp Calories 15, Total Fat 1.5 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 3 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 1 g, Vit. D 0 mcg, Calcium 6 mg, Iron 3 mg, Potas. 108 mg. Ingredients: Cocoa.

APPROVED **2022** Top Pick for 100% Cocoa Powders Good & Gather [Target] Unsweetened Cocoa Powder - 100% Cocoa  Dist. by Target Corporation	1 tbsp [5 g] Flavanols: 92 mg (**18.4 mg/g**) Cadmium: 0.53 mcg (**0.11 mcg/g**) Lead: 0.32 mcg (**0.06 mcg/g**) Arsenic: 0.21 mcg (**0.04 mcg/g**)	Caffeine: 6.6 mg Theobromine: 121.5 mg Calories: 10 [2 Cal/g] *Moderately rich cocoa flavor - not bitter*	$0.04/tbsp **[$0.10]** $1.99/8 oz [226 g] container (approx. 45 servings)	Source: Not listed *Kosher. No Artificial Flavors, Preservatives or Synthetic Colors.*	1 tbsp Calories 10, Total Fat 0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 3 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 1 g, Vitamin D 0 mcg, Calcium 10 mg, Iron 2.1 mg, Potassium 80 mg. Ingredients: Cocoa.
APPROVED **for Adults** **2019** Hershey's Cocoa Special Dark - 100% Cacao  Dist. by The Hershey Company	1 tbsp [5 g] Flavanols: 9.3 mg (**1.9 mg/g**) Cadmium: 3.2 mcg (**0.64 mcg/g**), which is over the Health Canada limit for children of 3.0 mcg per serving Lead: 0.36 mcg (**0.07 mcg/g**) Arsenic: <0.25 mcg (**<0.05 mcg/g**)	Was not tested for caffeine and theobromine Calories: 10 [2 Cal/g] *Smooth, moderate chocolate flavor. Very dark color.* Note: Dutched - alkali processed	$0.10/tbsp **[$2.06]** $4.29/8 oz [226 g] container (approx. 45 servings) *2019 price: $4.29/8 oz [226 g] container*	Source: Not listed *Non GMO Project Verified seal. No Artificial Flavors. No Artificial Colors. No Preservatives. Gluten Free. Kosher.*	1 tbsp Calories 10, Total Fat 0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 3 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein, Vitamin D 0 mcg, Calcium 10 mg, Iron 2.1 mg, Potassium 250 mg. Ingredients: Cocoa Processed With Alkali.

NOT APPROVED 2019 Navitas™ Organic Cacao Powder  Dist. by Navitas Organics SOURCE HAS CHANGED FROM PERU TO SIERRA LEONE	2.5 tbsp [15 g] Flavanols: 374.4 mg (**25 mg/g**) (53.5% of listed amount of 700 mg) Cadmium: 9.7 mcg (**0.65 mcg/g**) Lead: 1.1 mcg (**0.07 mcg/g**) Arsenic: <0.75 mcg (**<0.05 mcg/g**)	Was not tested for caffeine and theobromine Calories: 60 [4 Cal/g] 1 serving per day. *Somewhat smooth, mild chocolate flavor, very slightly bitter*	$0.68/2.5 tbsp [**$0.19** based on amount *claimed*] [**$0.36** based on amount *found*] $10.20/8 oz [227 g] bag (approx. 15 servings) *2019 price: $9.34/8 oz [227 g] bag*	Source: Peru (2022: Source now listed as Sierra Leone) *USDA Organic seal. Non GMO Project Verified seal. Kosher. BPA Free. International Fairtrade Certification seal.*	2.5 tbsp Calories 60, Total Fat 1.5 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 8 g, Dietary Fiber 5 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 4 g, Vitamin D 0 mcg, Calcium 35 mg, Iron 2 mg Additional Information 2.5 tbsp Calories 60, Total Fat 1.5 g, Saturated Fat 1 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 8 g, Dietary Fiber 5 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 4 g, Vitamin D 0 mcg, Calcium 35 mg, Iron 2 mg, Potassium 300 mg, Magnesium 106 mg. Ingredients: Certified organic cacao powder (Theobroma cacao).
APPROVED **2022** Nestle® Toll House® 100% Pure Cocoa  Dist. by Nestle USA, Inc.	1 tbsp [5 g] Flavanols: 19.9 mg (**4 mg/g**) Cadmium: 1.2 mcg (**0.24 mcg/g**) Lead: 0.37 mcg (**0.07 mcg/g**) Arsenic: 0.21 mcg (**0.04 mcg/g**)	Caffeine: 10.2 mg Theobromine: 110.5 mg Calories: 10 [2 Cal/g] *Moderately rich cocoa flavor*	$0.06/tbsp **[$0.57]** $2.55/8 oz [226 g] container (approx. 45 servings)	Source: Not listed *Kosher. No Preservatives, Artificial Flavors or colors.*	1 tbsp Calories 10, Total Fat 0.5 g, Sat. Fat 0 g, Sodium 0 mg, Total Carb. 3 g, Fiber 2 g, Protein 1 g, Iron 2.1 mg. Ingredient: Cocoa.

APPROVED **2022** NOW® Organic Cocoa Powder - 100% Cocoa  Dist. by NOW Foods	1 tsp [2.5 g] Flavanols: 48.9 mg (**19.6 mg/g**) Cadmium: 1.3 mcg (**0.52 mcg/g**) Lead: 0.28 mcg (**0.11 mcg/g**) Arsenic: 0.17 mcg (**0.07 mcg/g**)	Caffeine: 5.8 mg Theobromine: 59 mg Calories: 10 [4 Cal/g] *Rich cocoa flavor - not bitter*	$0.08/tsp **[$0.32]** $10.54/12 oz [340 g] container (approx. 136 servings)	Source: Not listed *USDA Organic seal. Non GMO Projected Verified seal. Kosher. Gluten Free. No Sugar Added. Non-Alkalized. Vegan. Certified Organic by QAI.*	1 tsp Calories 10, Total Fat <0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate <1 g, Dietary Fiber <1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein <1 g, Vit. D 0 mcg, Calcium 4 mg, Iron 1 mg, Potas. 60 mg Additional Information 1 tsp Calories 10, Total Fat <0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate <1 g, Dietary Fiber <1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein <1 g, Vit. D 0 mcg, Calcium 4 mg, Iron 1 mg, Potas. 60 mg. Ingredients: Organic Cocoa Powder.

APPROVED **2022** Terrasoul Superfoods Cacao Powder - 100% Cacao  Dist. by Terrasoul Superfoods, LLC	1 tsp [3 g] Flavanols: 61.1 mg (**20.4 mg/g**) Cadmium: 1.2 mcg (**0.41 mcg/g**) Lead: 0.21 mcg (**0.07 mcg/g**) Arsenic: 0.16 mcg (**0.05 mcg/g**)	Caffeine: 8.6 mg Theobromine: 69.6 mg Calories: 12 [4 Cal/g] *Rich cocoa flavor - very mildly bitter*	$0.08/tsp **[$0.27]** $12.49/16 oz [454 g] container (approx. 151 servings)	Source: Sierra Leone, Ghana, Ivory Coast or Dominican Republic *Non GMO Projected Verified seal. USDA Organic seal. Kosher. Raw.* **Precaution:** Allergy Info: Packaged in a facility that handles tree nuts.	1 tsp Calories 12, Total Fat 0.3 g, Saturated Fat 0.2 g, Trans Fat 0 g, Cholesterol 0 mg, Total Carbohydrate 2 g, Dietary Fiber 1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 1 g, Vitamin D 0 mcg, Calcium 7 mg, Iron 0.4 mg, Potassium 58 mg, Magnesium 20 mg Additional Information 1 tsp Calories 12, Total Fat 0.3 g, Saturated Fat 0.2 g, Trans Fat 0 g, Cholesterol 0 mg, Total Carbohydrate 2 g, Dietary Fiber 1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 1 g, Vitamin D 0 mcg, Calcium 7 mg, Iron 0.4 mg, Potassium 58 mg, Magnesium 20 mg. Ingredients: Organic Cacao Powder (Theobroma cacao).

NOT APPROVED 2019 Trader Joe's® Organic Fair Trade Cacao Powder  Dist. by Trader Joe's	1 tbsp [5 g] Flavanols: 76 mg (**15.2 mg/g**) Cadmium: 4.9 mcg (**0.98 mcg/g**) Lead: 0.17 mcg (**0.03 mcg/g**) Arsenic: 0.32 mcg (**0.06 mcg/g**)	Was not tested for caffeine and theobromine Calories: 20 [4 Cal/g] *Somewhat bitter/sour, mild chocolate flavor*	$0.11/tbsp **[$0.28]** $4.99/ 8 oz [227 g] bags (approx. 45 servings) *2019 price: $3.99/8 oz [227 g] bar*	Source: Peru *Kosher. Quality Assurance International Certified Organic seal. USDA Organic seal. International Fairtrade Certification seal.*	1 tbsp Calories 20, Total Fat 0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 3 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 1 g, Vitamin D 0 mcg, Calcium 10 mg Additional Information 1 tbsp Calories 20, Total Fat 0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 3 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 1 g, Vitamin D 0 mcg, Calcium 10 mg, Iron 0.6 mg, Potassium 100 mg. Ingredients: Organic cacao powder.

APPROVED 2019 Valrhona Poudre De Cacao Cocoa Powder - 100% Cacao  Dist. by Valrhona	5 g Flavanols: 14.6 mg (**2.9 mg/g**) Cadmium: 0.5 mcg (**0.1 mcg/g**) Lead: 0.49 mcg (**0.1 mcg/g**) Arsenic: <0.25 mcg (**<0.05 mcg/g**)	Was not tested for caffeine and theobromine Calories: 22.5 [4.5 Cal/g] *Smooth, earthy moderate chocolate flavor. Very dark color.* Note: Dutched - alkali processed	$0.29/5 g **[$3.97]** $14.49/8.82 oz [250 g] container (approx. 50 servings) *2019 price: $16.50/8.82 oz [250 g] container*	Source: Not listed Kosher.	5 g Calories 22.5, Calories from Fat 10, Total Fat 1.125 g, Saturated Fat 1.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 1.25 mg, Total Carbohydrate 2 g, Dietary Fiber 1.375 g, Sugars 0.125 g, Protein 1.125 g, Percent of recommended daily intake: Vitamin A 0% Additional Information 5 g Calories 22.5, Calories from Fat 10, Total Fat 1.125 g, Saturated Fat 1.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 1.25 mg, Total Carbohydrate 2 g, Dietary Fiber 1.375 g, Sugars 0.125 g, Protein 1.125 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 0.75%, Iron 18.75%. Ingredients: Cocoa powder.

APPROVED 2019 Volupta Cacao Powder  Dist. by Volupta, LLC	1 tbsp [5 g] Flavanols: 105.6 mg (**21.1 mg/g**) (claimed 55 mg ✓) Cadmium: 2.9 mcg (**0.59 mcg/g**) Lead: 0.46 mcg (**0.09 mcg/g**) Arsenic: 0.31 mcg (**0.06 mcg/g**)	Was not tested for caffeine and theobromine Calories: 20 [4 Cal/g] *Slightly bitter, moderate chocolate flavor*	$0.08/tbsp [**$0.30** based on amount *claimed*] [**$0.16** based on amount *found*] $14.99/32 oz [907 g] bags (approx. 181 servings) *2019 price: $32.99/two 32 oz [907 g] bags*	Source: Peru, Ecuador*USDA Organic seal. Non GMO Project Verified seal. International Fairtrade Certification seal. Kosher. Vegan.* Precaution: Prop 65 Warning for Reproductive Health. Processed In A Facility That Also Handles Additional Information Source: Peru, Ecuador*USDA Organic seal. Non GMO Project Verified seal. International Fairtrade Certification seal. Kosher. Vegan.* Precaution: Prop 65 Warning for Reproductive Health. Processed In A Facility That Also Handles Egg, Dairy, Soy, Wheat, Tree Nut, Fish.	1 tbsp Calories 20, Total Fat 0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Polyunsaturated Fat 0 g, Mono-unsaturated Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 3 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g Additional Information 1 tbsp Calories 20, Total Fat 0.5 g, Saturated Fat 0 g, Trans Fat 0 g, Polyunsaturated Fat 0 g, Monounsaturated Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 3 g, Dietary Fiber 2 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 1 g, Vitamin D 0 mcg, Calcium 10 mg, Iron 0.6 mg, Potassium 100 mg, Magnesium 40 mg, Copper 0.2 mg. Ingredients: Organic Cacao Powder.

NOT APPROVED **2022** Wildly Organic™ Fermented Cacao Powder - 100% Cacao  Dist. by Wildly Organic™ LLC	1/4 cup [28 g] Flavanols: 305.2 mg (**10.9 mg/g**) Cadmium: 12.5 mcg (**0.45 mcg/g**) Lead: 1.9 mcg (**0.07 mcg/g**) Arsenic: 1.3 mcg (**0.05 mcg/g**)	Caffeine: 86 mg Theobromine: 618.8 mg Calories: 143 [5.1 Cal/g] *Moderately rich cocoa flavor - not bitter*	$1.16 per 1/4 cup **[$0.76]** $9.42/8 oz [227 g] container (approx. 8 servings)	Source: Not listed *USDA Organic seal. Non GMO Projected Verified seal. Fairtrade® seal. Kosher. Vegan. Raw.* **Precaution:** May contain desiccant and oxygen absorber packets to preserve freshness. Warning: Cancer and Reproductive Harm Additional Information Source: Not listed *USDA Organic seal. Non GMO Projected Verified seal. Fairtrade® seal. Kosher. Vegan. Raw.* **Precaution:** May contain desiccant and oxygen absorber packets to preserve freshness. Warning: Cancer and Reproductive Harm [CA Prop 65]. Processed in a facility that also processes tree nuts (never peanuts).	1/4 cup Calories 143, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Total Carbohydrate 9 g, Dietary Fiber 5 g, Total Sugars [Includes 0 g Added Sugars] less than 1 g, Protein less than 1 g, Potassium 236 mg, Calcium 29 mg, Iron 1.9 mg, Magnesium 92 mg Additional Information 1/4 cup Calories 143, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Total Carbohydrate 9 g, Dietary Fiber 5 g, Total Sugars [Includes 0 g Added Sugars] less than 1 g, Protein less than 1 g, Potassium 236 mg, Calcium 29 mg, Iron 1.9 mg, Magnesium 92 mg. Ingredients: Fermented organic cacao powder.
Hot Cocoa Mixes:					

APPROVED **for Adults** **2022** **Top Pick** **for Hot Cocoa Mixes** **Ghirardelli® Double Chocolate Hot Cocoa Mix**  Dist. by Ghirardelli Chocolate Company	2 tbsp [24 g] Flavanols: 48.1 mg (**2 mg/g**) Cadmium: 0.84 mcg (**0.04 mcg/g**) Lead: 1.6 mcg (**0.07 mcg/g**), which is over CL's limit for children of 0.5 mcg per serving in cocoa products marketed for children, i.e., hot cocoa mixes Arsenic: <0.46 mcg (**<0.02 mcg/g**)	Caffeine: 10.4 mg Theobromine: 108.2 mg Calories: 90 [3.8 Cal/g] *Moderately rich cocoa flavor, mildly sweet* Note: Dutched - alkali processed	$0.37/2 tbsp **[$1.54]** $27.66/six 10.5 oz [298 g] bag (approx. 75 servings) $4.61/bag	Source: Not listed *Kosher.* **Precaution:** May contain milk, egg, tree nuts, and wheat.	2 tbsp Calories 90, Total Fat 1 g, Saturated Fat 0.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 22 g, Dietary Fiber 2 g, Total Sugars [Includes 19 g Added Sugars] 19 g, Protein <1 g, Vit. D 0 mcg, Calcium 10 mg, Iron 0.8 mg, Potas. 130 mg. Ingredients: Sugar, cocoa processed with alkali Additional Information 2 tbsp Calories 90, Total Fat 1 g, Saturated Fat 0.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 22 g, Dietary Fiber 2 g, Total Sugars [Includes 19 g Added Sugars] 19 g, Protein <1 g, Vit. D 0 mcg, Calcium 10 mg, Iron 0.8 mg, Potas. 130 mg. Ingredients: Sugar, cocoa processed with alkali, unsweetened chocolate, soy lecithin, vanilla extract.

APPROVED **for Adults** **2022** **Nestle® Hot Cocoa Mix**  Dist. by Nestle USA, Inc.	1 packet [20.2 g] Flavanols: 12.6 mg (**0.6 mg/g**) Cadmium: <0.32 mcg (**<0.02 mcg/g**) Lead: 0.73 mcg (**0.04 mcg/g**), which is over CL's limit for children of 0.5 mcg per serving in cocoa products marketed for children, i.e., hot cocoa mixes Arsenic: 0.46 mcg (**0.02 mcg/g**)	Caffeine: 2.3 mg Theobromine: 29.3 mg Calories: 80 [4 Cal/g] *Slightly milky, moderately sweet, moderate chocolate flavor - lighter color than others* Note: Dutched - alkali processed	$0.13/packet **[$2.06]** $6.48/50 packets	Source: Not listed **Precaution:** Contains: Milk. May Contain Soy And Wheat.	1 packet Calories 80, Total Fat 2 g, Saturated Fat 1.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 190 mg, Total Carbohydrate 15 g, Dietary Fiber <1 g, Total Sugars [Includes 10 g Added Sugars] 12 g, Protein <1 g, Vitamin D 0 mcg, Calcium 0 mg, Iron 0.6 mg, Potassium 140 mg. Ingredients: Sugar, Corn Syrup Solids, Dairy Product Solids (Milk), Hydrogenated Vegetable Oil (Coconut And/Or Palm Kernel And/Or Soybean), Cocoa Processed With Alkali, And Less Than 2% Of Salt, Cellulose Gum, Sodium Caseinate (Milk) Additional Information 1 packet Calories 80, Total Fat 2 g, Saturated Fat 1.5 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 190 mg, Total Carbohydrate 15 g, Dietary Fiber <1 g, Total Sugars [Includes 10 g Added Sugars] 12 g, Protein <1 g, Vitamin D 0 mcg, Calcium 0 mg, Iron 0.6 mg, Potassium 140 mg. Ingredients: Sugar, Corn Syrup Solids, Dairy Product Solids (Milk), Hydrogenated Vegetable Oil (Coconut And/Or Palm Kernel And/Or Soybean), Cocoa Processed With Alkali, And Less Than 2% Of Salt, Cellulose Gum, Sodium Caseinate (Milk), Dipotassium Phosphate, Sodium Aluminosilicate, Mono- And Diglycerides, Guar

					Gum, Artificial Flavor, Sucralose.
Cacao Nibs:					
NOT APPROVED **2019** Healthworks® Cacao Nibs  Dist. by Healthworks	1 oz [28 g] Flavanols: 507.4 mg (**18.1 mg/g**) Cadmium: 12.6 mcg (**0.45 mcg/g**) Lead: 1.4 mcg (**0.05 mcg/g**) Arsenic: <1.4 mcg (**<0.05 mcg/g**)	Was not tested for caffeine and theobromine Calories: 130 [4.6 Cal/g] *Very crunchy, slightly bitter, mild chocolate flavor*	$0.77/oz **[$0.30]** $12.28/16 oz [454 g] bag (approx. 16 servings) *2019 price: $11.99/16 oz [454g] bag*	Source: Latin America USDA Organic seal.	1 oz Calories 130, Calories from Fat 110, Total Fat 14 g, Saturated Fat 8 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 10 g, Dietary Fiber 8 g, Sugars 0 g, Protein 4 g, Percent of recommended daily intake: Vitamin A 0% Additional Information 1 oz Calories 130, Calories from Fat 110, Total Fat 14 g, Saturated Fat 8 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 10 g, Dietary Fiber 8 g, Sugars 0 g, Protein 4 g, Percent of recommended daily intake: Vitamin A 0%, Vitamin C 0%, Calcium 2%, Iron 6%. Ingredients: Organic Cacao Nibs.

NOT APPROVED 2019 Best Option for Cacao Nibs Navitas™ Organics Organic Cacao Nibs  Dist. by Navitas Organics	3 tbsp [30 g] Flavanols: 677.1 mg (**22.6 mg/g**) (480 mg claimed ✓) Cadmium: 8.7 mcg (**0.29 mcg/g**) Lead: 0.75 mcg (**0.03 mcg/g**) Arsenic: <1.5 mcg (**<0.05 mcg/g**)	Was not tested for caffeine and theobromine Calories: 190 [6.3 Cal/g] 1 serving per day. *Very crunchy, slightly bitter, mild chocolate flavor*	$0.87/3 tbsp [**$0.36** based on amount *claimed*] [**$0.26** based on amount *found*] $6.99/8 oz [227 g] bag (approx. 8 servings) *2019 price: $6.99/8 oz [227 g] bar*	Source: Peru (2022: Peru no longer listed as source. Only claims to be "Fair Trade") *USDA Organic seal. Non GMO Project Verified seal. Kosher. BPA Free. International Fairtrade Certification seal.*	3 tbsp [30 g] Calories 190, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 11 g, Dietary Fiber 8 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 4 g, Vitamin D 0 mcg, Calcium 26 mg, Iron 1 mg, Potassium 255 mg, Magnesium 84 mg Additional Information 3 tbsp [30 g] Calories 190, Total Fat 15 g, Saturated Fat 9 g, Trans Fat 0 g, Cholesterol 0 mg, Sodium 0 mg, Total Carbohydrate 11 g, Dietary Fiber 8 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Protein 4 g, Vitamin D 0 mcg, Calcium 26 mg, Iron 1 mg, Potassium 255 mg, Magnesium 84 mg. Ingredients: Certified organic cacao nibs (Theobroma cacao).
Supplements:					

APPROVED **2022** Top Pick Overall and for Supplements CocoaVia™ Brain Health Memory+  Dist. by Mars Symbioscience, A Division Of Mars, Incorporated	3 vegetarian capsules Flavanols: 993.1 mg (**572.3 mg/g**) (750 mg claimed ✓) Cadmium: <0.01 mcg (**<0.005 mcg/g**) Lead: 0.018 mcg (**0.01 mcg/g**) Arsenic: 0.18 mcg (**0.09 mcg/g**)	Caffeine: 32.4 mg (30 mg claimed ✓) Theobromine: 133.2 mg Calories not listed Three Capsules Once Daily With Food. Large vegetarian capsule	$1.50/3 vegetarian capsules [**$0.40** based on amount *claimed*] [**$0.30** based on amount *found*] $44.99/90 vegetarian capsules	Source: Not listed **Precaution:** 30 mg Naturally Occurring Caffeine Per Serving.	3 vegetarian capsules Cocoapro™ Cocoa Extract (bean) [Cocoa Flavanols (of which 135 mg is (-)-epicatechin) 750 mg] 1,695 mg. Other Ingredients: Hypromellose Capsule.
APPROVED **2022** CocoaVia™ Cardio Health  Dist. by Mars Symbioscience, A Division Of Mars, Incorporated	2 capsules Flavanols: 579.6 mg (**509.9 mg/g**) (500 mg claimed ✓) Cadmium: <0.007 mcg (**<0.005 mcg/g**) Lead: 0.007 mcg (**0.01 mcg/g**) Arsenic: 0.1 mcg (**0.08 mcg/g**)	Caffeine: 19.5 mg (25 mg claimed ✓) Theobromine: 85.6 mg Calories not listed Two Capsules Daily With Food. Large capsule	$1.27/2 capsules [**$0.51** based on amount *claimed*] [**$0.44** based on amount *found*] $37.97/60 capsules	Source: Not listed **Precaution:** 25 mg Naturally Occurring Caffeine Per Serving.	2 capsules Cocoapro™ cocoa extract (bean) [Cocoa Flavanols (of which 85 mg is (-)-epicatechin) 500 mg] 1,130 mg. Other Ingredients: Hypromellose Capsule.

APPROVED **2022** CocoaVia™ Cardio Health - Dark Chocolate Flavor Mix  Dist. by Mars Symbioscience, A Division Of Mars, Incorporated	1 scoop [6.4 g] Flavanols: 679 mg (**106.1 mg/g**) (500 mg claimed ✓) Cadmium: 0.45 mcg (**0.07 mcg/g**) Lead: 0.22 mcg (**0.03 mcg/g**) Arsenic: 0.24 mcg (**0.04 mcg/g**)	Caffeine: 19.9 mg (30 mg claimed ✓) Theobromine: 104.3 mg Calories: 10 [1.56 Cal/g] Mix 1 Scoop Daily To Milk, Coffee, Or Your Favorite Non-Dairy Alternative. Loose powder in jar *Very dark brown powder, mixes easily. Moderate cocoa flavor, slightly bitter.*	$1.33/scoop [**$0.53** based on amount *claimed*] [**$0.39** based on amount *found*] $39.97/6.8 oz [192 g] container (approx. 30 servings)	Source: Not listed *No artificial colors. No added sugar.* **Precaution:** 30 mg Naturally Occurring Caffeine Per Serving.	1 scoop Calories 10, Total Carbohydrate 4 g, Dietary Fiber 3 g, Protein <1 g, Cocoapro™ Cocoa Extract (bean) [Cocoa Flavanols (of which 80 mg is (-)-epicatechin) 500 mg] 1,150 mg. Other Ingredients: Cocoa Powder (Processed With Alkali), Oat Fiber, Natural Flavor.
APPROVED **2023** CocoaVia™ Heart & Brain  Dist. by Mars Symbioscience, A Division Of Mars, Incorporated	2 capsules Flavanols: 667.2 mg (**588.4 mg/g**) (500 mg claimed ✓) Cadmium: <0.012 mcg (**<0.01 mcg/g**) Lead: 0.003 mcg (**0.007 mcg/g**) Arsenic: 0.17 mcg (**0.15 mcg/g**)	Caffeine: 22 mg (25 mg claimed ✓) Theobromine: 70 mg Calories not listed Two Capsules Once Daily With Food. Large capsule	$1.50/2 capsules [**$0.60** based on amount *claimed*] [**$0.45** based on amount *found*] $44.99/60 capsules	Source: Not listed.	2 capsules Cocoapro™ Cocoa Extract (bean) [Cocoa Flavanols 500 mg] 1,130 mg. Other Ingredients: Hypromellose Capsule.

APPROVED **2022** Nootropics Depot Chocamine® Extract  Dist. by Nootropics Depot	1 g Flavanols: 2.4 mg (**2.4 mg/g**) Cadmium: 0.32 mcg (**0.32 mcg/g**) Lead: 0.08 mcg (**0.08 mcg/g**) Arsenic: 0.06 mcg (**0.06 mcg/g**)	Caffeine: 1.6 mg Theobromine: 58.8 mg Calories not listed Take 1,000 mg once daily. Loose powder in jar *Very bitter (due to added theobromine), moderate cocoa flavor*	$0.26/g **[$21.67]** $32.99/4.4 oz [125 g] jar (approx. 125 servings)	Source: Not listed	1 g Chocamine® Proprietary Cocoa Extract [Lowfat Cocoa, Theobromine, Tapioca Starch (2% or less), Natural Vanilla Flavor, Spices (Ginger, Allspice, Cinnamon)] 1,000 mg. Other Ingredients: None listed.

Products tested in 2019 and 2022

ConsumerTips™:

As shown in the test results above, the flavanol content of cocoa and cacao products can vary tremendously and most products do not list their flavanol content. Use the information in the third column to compare the amounts found. Be aware that caffeine levels also range widely: Some products contain little while others provide more caffeine than a cup of coffee. Use the information in the fourth column of the table above to compare amounts of caffeine in products. An effective dose of flavanols from cocoa products has not been established for any specific purpose, although positive results have been seen with dosages ranging from about 50 mg to 200 mg or more per day. As noted above, in Europe, cocoa-based products providing at least 200 mg of total flavanols per day are permitted to claim an effect which may promote normal blood flow. To get 200 mg of flavanols from a natural or raw, unsweetened cocoa powder, you would need about 1 to 1¼ tablespoons of powder. Some products, however, are made to contain higher concentrations of flavanols.

Products made from cocoa powder which has been **Dutched (alkaline processed)** -- which lowers the bitterness and darkens the color of cocoa powder -- have lower concentrations of flavanols: light Dutching reduces levels by about 60%, medium Dutching by about 75%, and heavy Dutching by about 90% according to one study (Miller, J Agric Food Chem 2008). Dutched cocoa powders and chocolates

sold in the U.S. must include the statement "Processed with alkali" or identify the specific alkali used, e.g., "Processed with sodium bicarbonate." However, they need not specify whether a light, medium or heavy Dutching process was used. It is not clear if alkaline processing affects heavy metal contamination.

It is interesting to note that although the *CocoaVia* mix (powder) tested in this Review includes cocoa powder "processed with alkali," this powder is combined with a high-flavanol cocoa extract, so the resulting product is high in flavanols. According to a communication received by ConsumerLab (on 8/25/17) from Mars, maker of *CocoaVia*, the alkalized cocoa is added to provide a richer taste and darker color to the extract, which is made from fresh cocoa beans (using the "Cocoapro process") that are higher in flavanols than the fermented and roasted beans traditionally used to make cocoa powders.

Be aware that mixing cocoa with some fruits and vegetables that have a certain enzyme (polyphenol oxidase) can destroy cocoa flavanols. This is particularly true with fruits and vegetables that brown when cut (e.g., apples, bananas, and pears), as well as beets and beet greens (Moon, Molecules 2020). A small clinical study showed that consuming a cocoa extract (Cocoapro™ cocoa extract by Mars, Inc.) mixed into a smoothie containing 1.5 medium bananas reduced the amount of flavanol metabolites in the blood by 84% compared to the same smoothie without banana. In contrast, mixing the cocoa extract into a mixed berry smoothie did *not* have this effect. Even consuming a banana smoothie along with, but not mixed with, cocoa extract reduced flavanol metabolites, but not by as much as when the two were mixed (Ottaviani, Food Funct 2023).

Are cocoa and chocolate good sources of iron and copper?

Like cadmium and lead, iron, and copper (and other minerals like calcium, magnesium and zinc) are absorbed from the soil as cacao plants grow (Aikpokpodion, J Agri Sci 2010).

The amount of iron in a particular cocoa powder or chocolate will vary, but is estimated to be about 1 or 2 mg in a 5-gram tablespoon of cocoa powder and about 3 milligrams in a 40-gram serving of dark chocolate. However, not all the iron in cocoa and chocolate products is absorbed (Yokoi, Br J Nutr 2009). The type of iron found in plants is absorbed only about half as well as iron from animal sources. Additionally, polyphenols in cocoa and chocolate can interfere with iron absorption (Natsume, Biosci Biotechnol Biochem 2000;Hurrell, Br J Nutr 1999). One clinical study in children found that iron absorption from a chocolate flavored drink containing 158 mg of polyphenols was very low, but was significantly improved when vitamin C (known to increase iron absorption) was added to the drink (Davidsson, Am J Clin Nutr 1998). So while cocoa and chocolate provide some iron, don't count on them to significantly contribute to the daily recommended intake, which generally ranges from 7 mg to 18 mg depending on your age and gender and is 27 mg for pregnant women (See the Iron Review for more about iron requirements) — and you don't need to worry about it causing you to exceed the tolerable daily intake level for iron, which is 40 to 45 mg.

Cocoa and chocolate, particularly dark chocolate, can be good sources of **copper**, which is necessary for proper function of the immune and nervous systems as well as for cardiovascular health. Depending on the form of chocolate, a typical serving may provide anywhere from about 20% to more than 100% of the RDA for copper for adults, which is 900 mcg, and dark chocolate contains much more copper than milk chocolate. Approximate amounts of copper in cocoa-based products are as follows: 28 grams (about 1 oz) of unsweetened baking chocolate (938 mcg), 50 grams of dark chocolate (70-85% cacao solids) (895 mcg), 50 grams (1.8 oz) of milk chocolate (246 mcg), and one tablespoon of dry, unsweetened cocoa powder (205 mcg) (USDA FoodData Central 2023). Although toxicity can occur with excessive intake of copper, you would need to consume extremely large quantities of cocoa or chocolate to approach or exceed the UL for copper (10,000 mcg per day). (Note: excessive **zinc supplementation** can cause copper *deficiency*).

What about the fat in dark chocolate bars?

While cocoa powder contains only cocoa solids, chocolate bars contain both cocoa solids and cocoa butter — the fat from cocoa beans. The majority of the fat in cocoa butter, about 65% or so, is saturated fat, mostly palmitic acid and stearic acid. Cocoa butter contains smaller amounts of the unsaturated fats oleic acid (30%) and linoleic acid (3%) (Liendo, Food Res Int 1997). Dark chocolate does not contain trans-fat. Since cocoa butter is a relatively expensive ingredient, some chocolate manufacturers replace a portion of the fat in cocoa butter with less expensive "replacement" fats, such as palm or soybean oil, but, in the U.S., such products must be labeled as "chocolate flavored" rather than "chocolate."

Acrylamide in cocoa and chocolate — a concern?

Acrylamide is a neurotoxin and probable carcinogen produced when cocoa beans are roasted (part of typical processing). FDA tests in 2002 found amounts of acrylamide in various cocoa powders and chocolate bars to range from 0.29 mcg to 4.5 mcg per serving (see table below), although other foods, particularly potato-based products like fries, cookies, crackers, and coffee generally contribute higher amounts to the daily diet — estimated to be about 35 mcg for an adult. Dutched (alkalized) and milk chocolate have lower concentrations of acrylamide — but also lower levels of flavanols. Nevertheless, it's best to minimize intake of acrylamide when possible. Even a small amount of acrylamide may slightly increase the risk of tumors, leading the state of California to require a warning label on foods containing more than 0.2 mcg (micrograms) of acrylamide per daily serving, although there is little risk of neurotoxicity with exposure to less than 140 mcg per day according to the EPA.

Acrylamide in Cocoa and Chocolate

Cocoa or Chocolate	Parts per Billion (mcg/kilogram)	Per Serving (Calculated for 5 grams of cocoa or 40 grams of chocolate)
Hershey's Cocoa	909	4.5 mcg
Hershey's European Style Dutch Processed Cocoa	58	0.29 mcg
Ghirardelli Unsweetened Cocoa	316	1.58 mcg
Ghirardelli Bittersweet Chocolate Baking Bar	93	3.7 mcg
Baker's Bittersweet Baking Chocolate Squares	104	4.2 mcg
Hershey's Milk Chocolate Bar	Not detectable	N/A

Source: FDA Acrylamide in Food Survey Data 2002

Child labor and cocoa production

Be aware that, despite promises to eradicate the unethical practice, cocoa sourced from West Africa, and possibly other countries, may be the product of child labor. Several organizations help to provide oversight and set standards for ethically responsible cocoa farming and production, including Fair Trade International, Fair for Life, and the Rainforest Alliance. Cocoa products and chocolate bars that meet these standards, which include no use of forced or child labor, may bear these organizations' seals on their labels. ConsumerLab lists these seals, as well as the country of origin (when available) as "Notable Features" in the 5th column of the Results table.

Concerns and Cautions:

Cocoa and chocolate products are generally safe. In a 3-month study of healthy men and women, a dose of up to 1,000 mg of cocoa flavanols from a cocoa extract taken twice a day with meals was found to be safe and well-tolerated, with no significant changes in blood pressure, platelet function, cholesterol, or heart rate (Ottaviani, Am J Clin Nutr 2015). However, one study suggests that high flavanol (90%) chocolate may modestly slow blood clotting in healthy men, and, as discussed below, cocoa/dark chocolate consumption may enhance the effects of certain antiplatelet medications.

Bear in mind that some cocoa-based products, particularly chocolate, contain high amounts of added sugars and fats and contribute a significant number of calories. These should be used in moderation, as excessive intake of sugars, fats, and calories may negate any positive benefits of flavanols.

Enhanced effect of antiplatelet medication

Be aware that cocoa and dark chocolate may increase the antiplatelet effect of certain blood-thinning medications. Consuming 30 grams of dark chocolate (65% cocoa solids) daily for one week was shown to significantly enhance the antiplatelet effects of **clopidogrel (Plavix),** and resulted in a slight, but non-significant increase in the antiplatelet effects of **aspirin** in people with coronary artery disease who were taking both medications (see **What It Does** for details). Although more research is needed, some experts

suggest that the effects of cocoa and dark chocolate on platelet reactivity would not impact use of more potent blood-thinning medications such as prasugrel (Effient), ticagrelor (Brilinta) or direct oral anticoagulants such as dabigatran (Pradaxa), rivaroxaban (Xarelto), apixaban (Eliquis) (Seecheran, Open Heart 2022).

Caffeine and Theobromine

While the amounts of **caffeine and theobromine** found in typical servings of cocoa and chocolate are generally well-tolerated, they can cause side effects such as heartburn, gastritis, insomnia, anxiety, and heart arrhythmias in some people, as well as interfere with the actions of drugs used for these conditions and with stimulant drugs and MAO inhibitors. In the study noted above, gastrointestinal side effects were more frequent when cocoa extract was taken on an empty stomach than with meals.

Higher intakes of theobromine can cause other side effects in some people. For example, daily intake of 50 - 100 grams of cocoa (providing 800 mg to 1,500 mg of theobromine) has been associated with **sweating, trembling and severe headache** (IARC 2018). Theobromine has also been reported to cause nausea and vomiting in some individuals taking a very high dose (1000 mg per day -- equivalent to the amount of theobromine in three to five 40-gram bars of dark chocolate) (Baggott, Psychopharmacology (Berl) 2013). High amounts of **theobromine might also be an issue for people who need to control blood sugar levels.** Results of a study in which 500 mg of theobromine was taken daily by overweight but otherwise healthy men and women for four weeks found that blood glucose rose significantly more after eating as compared to responses in the same people when theobromine was not taken. As noted earlier, moderate consumption of cocoa flavanols as well as chocolate intake may help control blood sugar and reduce the risk of diabetes, but not higher levels. If blood sugar control is an issue for you, it would seem wise to limit intake of dark chocolate to no more than two servings per week.

Caffeine and theobromine are ***toxic to dogs and cats***. See a Chocolate Toxicity Calculator for estimates of toxicity based on the weight of the animal and the amount and type of chocolate consumed. Initial signs of caffeine/theobromine intoxication in pets are extreme thirst, vomiting, diarrhea, abdominal distention, and restlessness, which can progress to hyperactivity, increased urination, rigidity, tremors, fast, slow or irregular heartbeat, high or low blood pressure, seizures, coma and even death. Dark chocolate is more toxic than milk chocolate.

Migraine?

Consumption of cocoa and/or chocolate has been reported to trigger migraines in some people, however, the evidence for this is mixed, and it is unclear exactly how cocoa may trigger migraines. Cocoa contains the trace amines phenylethylamine and tyramine (approximately 0.1 - 2.8 mcg/g and 3.6 - 8.3 mcg/g, respectively), which are also found in foods such as wine and cheese and which people with migraines are often advised to avoid. However, clinical studies of the effects of these amino acids in people with migraine have yielded mixed results, with some finding an increase in the incidence in migraine and others finding no increase (Hannington, Br Med J 1967; Moffet, J Neurol Neurosurg Psychiatry 1972; Sandler, Nature 1974). Cocoa also contains histamine, a substance which can dilate blood vessels and cause allergic reactions such as rash and headache in some people (Kovacova-Hanuskova, Allergol Immunopathol (Madr) 2015). Cocoa ingestion has been shown in one clinical study to increase blood flow to the brain, which, theoretically, might trigger migraine in some people (Lamport, Psychopharmacology 2015). Interestingly, however, double-blind clinical studies of chocolate consumption, a single serving of chocolate between 44 and 62 grams has not found an increased risk of migraine in people with a history of migraine, compared to placebo; a review of these and other studies concluded that there was no reliable scientific basis to support the recommendation that people with migraines avoid chocolate and cocoa-containing foods (Lippi, Acta Biomed 2014). In addition, animal studies have found cocoa and cocoa extract to have anti-inflammatory effects on the trigeminal nerve (inflammation of which is associated with migraine) and surrounding tissues, suggesting a possible benefit for migraine — although this has not been studied yet in people (Abbey, J Ethnopharmacol 2008; Cady, Mol Nutr Food Res 2013).

Kidney stones

The National Kidney Foundation advises individuals who are prone to developing **calcium oxalate kidney stones** (the most common type of kidney stone) to avoid cocoa and chocolate because they contain high amounts of oxalates — naturally occurring compounds that bind with calcium and form kidney stones in some people. In a small study among women (who were not noted to have a history of

kidney stones) consuming 68 grams (about 12 pieces) of dark chocolate (*Whittaker's dark Ghana chocolate*, 72% cocoa) increased urinary oxalate output by an average of 69% over a six-hour period compared to when chocolate was not consumed (Schroder, J Food Compost Anal 2011).

Cocoa powder contains higher concentrations of oxalates than chocolate, as chocolate includes other ingredients, such as cocoa fat, that don't contribute oxalates. In the same study above, the researchers also analyzed the oxalate content of 15 cocoa powders and 34 dark/bitter chocolate bars. The powders averaged 729 mg of total oxalates per 100 grams while the dark chocolates averaged about one-third of that amount -- 254 mg total oxalates per 100 grams. Among the five dark chocolate bars purchased in the U.S., *Newman's Own Super Dark Chocolate* contained the lowest concentration of total oxalates (169 mg/100 grams) and *Ghirardelli Unsweetened Chocolate* contained the highest (322 mg/100 grams). Bars containing higher % cocoa tended to contain higher concentrations of oxalates, but not in all cases, suggesting that other factors, such as differences in cocoa bean varieties and processing methods may also affect oxalate content. A recommended low-oxalate diet may limit daily oxalate intake to 50 to 80 mg or less. Based on the average amounts found in this study, amounts of total oxalates in typical servings of cocoa powder (about 36 mg per 1 tablespoon) or dark chocolate (about 100 mg per 50-gram bar) would be close to, or exceed, this limit.

Acne

Although some studies using chocolate bars have not found chocolate to worsen **acne**, a small, double-blind, placebo-controlled study giving 100% cocoa powder (i.e., pure chocolate) to men ages 18 to 35 found a positive association between the number of pimples they developed and the use of cocoa. The men, who had a history of acne, were given a single serving ranging from 0 to 170 mg of cocoa powder in capsules and were followed for one week. Although some men given cocoa did not develop pimples during the week, and some men given placebo did, overall there was a modest but positive correlation between the amount of cocoa consumed and the number of pimples developed (Caperton, J Clin Aesthet Dermatol 2014).

Allergies

People with milk allergies should be aware that dark chocolate bars may contain milk. Tests published in 2020 by the FDA of 119 dark chocolate bars and chips specifically claiming to be "dairy-free" or "milk-free" showed that approximately 10% of these products contained milk. The FDA reported similar findings in 2015, which included finding milk in a bar labeled as "allergen-free."

Nickel

Cocoa powder and chocolate (and related products, like chocolate syrup) are among foods which have relatively high concentrations of nickel and may trigger **allergic contact dermatitis (eczema) in nickel-sensitive individuals**. This typically occurs when ingesting large portions or in conjunction with ingestion of large amounts of other high-nickel foods (such as peas and beans, canned foods, shellfish, oats (including granola), peanuts, hazelnuts, walnuts, and sunflower seeds) (Pizzutelli, Eur Ann All Clin Immunol, 2011). One case report involved four children in the U.S. with known nickel sensitivity who binged on chocolate Easter eggs (Jacob, Ped Derm 2014). The U.S. FDA provides a listing of the amounts of nickel in common foods.

In response to a possible allergic reaction to nickel reported to ConsumerLab.com by a CL member who had used *CocoaVia*, CL purchased *CocoaVia Unsweetened Dark Chocolate Mix* and tested it for nickel in January 2016. For comparison, CL also tested a cocoa powder and a dark chocolate. The highest concentration of nickel was in the cocoa powder (*Hershey's Cocoa — Natural Unsweetened*) -- 9.0 mcg/g. This was followed by *CocoaVia* -- 5.85 mcg/g and *Endangered Species Natural Dark Chocolate 88% Cocoa* -- 5.56 mcg/g. These are higher levels than the FDA has reported in other foods, the highest of which was 3 mcg/g in sunflower seeds, followed by 2 mcg/g in an oat-based cereal, and 1 mcg/g in milk chocolate. The listed serving of 43 grams (half a bar) of *Endangered Species* dark chocolate therefore contained 239 mcg of nickel. This is similar to all the nickel in an adult daily diet, which has been reported to range from 200 to 300 mcg (Grandjean, IARC Sci Publ 1984). As the suggested serving sizes are smaller for *CocoaVia* (6.8 grams) and *Hershey's Cocoa Powder* (5 grams), total nickel per serving from these was 40 mcg and 45 mcg, respectively.

The take home message about nickel: Natural cocoa powder has more nickel per gram than *CocoaVia* (a cocoa extract) or dark chocolate (which, in turn, has much more nickel than milk chocolate), but the relatively large serving size of chocolate means higher total nickel exposure. However, at their suggested serving sizes, none of these exceeds the daily tolerable upper intake level for nickel,

which is 1,000 mcg (1 mg) — a limit based on nickel toxicity (IOM, 2001), not nickel allergy which can occur with lower amounts.

Interestingly, vitamin C, and certain foods or beverages, may reduce the absorption of nickel by forming nickel complexes or acting as a competitive inhibitor of nickel. A study of 5 healthy adults showed that drinking 100 mL of water containing 5 mg (5,000 mcg) of elemental nickel (as 22.4 mg of nickel sulfate) after an overnight fast increased blood levels of nickel by up to 80 mcg/L within 3 hours compared to baseline. However, consuming the same amount of nickel along with a meal consisting of bacon, eggs, toast, margarine and coffee appeared to completely block any increase in nickel in the blood. Similarly, consuming the nickel along with 250 mL of orange juice or 1 gram of ascorbic acid (vitamin C) in water reduced the increase in nickel in the blood to just 35 mcg/L and 53 mcg/L. Other beverages shown to suppress nickel absorption included coffee, tea, and milk (Solomons, J Nutr 1982). So, if you're sensitive to nickel and must consume a nickel-containing food, consume it with one of the beverages noted above or with vitamin C. It is unclear, however, if this reduction in nickel absorption reduces or prevents eczema symptoms in people with nickel sensitivity, as clinical studies in people with this condition are lacking.

Ochratoxin A

Cocoa beans can become contaminated with fungi which produce toxins, particularly during drying and storage. Ochratoxin A (OTA), a potential carcinogen and kidney toxin, is one of the most common fungal toxins to occur in cocoa beans. However, most OTA is found in the shell of the bean, which is removed during processing. An analysis of 85 cocoa and chocolate products sold in Canada between 2011 and 2012 found that two cocoa powders exceeded proposed European limits (which was never established), although the levels of OTA were still below 5 ppb, the European limit for OTA in roasted coffee (Turcotte, Mycotoxin Res 2013). For this reason, ConsumerLab.com did not include OTA testing in this Review.

Glyphosate

Contamination with the herbicide glyphosate does not appear to be a problem with chocolates. Tests on a small sampling of chocolate bars in 2022 found glyphosate levels to be less than 0.1% of the California Prop 65 warning level (see our article about **glyphosate**).

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