Health benefits of dark chocolate

ASSIGN BUSTER

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Get Your Daily Dose of Chocolate: The Darker, The Better!

It has been reported that there are certain types of bacteria located within the human stomach that will actually ferment chocolate into heart-healthy, anti-inflammatory compounds. At the 247th National Meeting & Exposition of the American Chemical Society, hosted at the Dallas Convention Center this last March, this conclusion was drawn and presented. Maria Moore – who is surprisingly enough, an undergraduate student working on this research – stated that two different types of microbes live within a person's stomach. There are good ones like " *Bifidobacterium* and lactic acid bacteria", which help to break down the chocolate, and then there's the not so great ones such as some forms of *Clostridia* and E. coli, which have been known to not only produce inflammation, but also to potentially cause " gas, bloating, diarrhea and constipation". She notes that, " When you eat dark chocolate, they [the good microbes] grow and ferment it, producing compounds that are anti-inflammatory". These researchers from Louisiana State University, led by John Finley, Ph. D., are the first to be conducting a study about dark chocolate's effects on the multiple bacteria that reside within the stomach. It was said that when the compounds are absorbed, they effectively reduce the possibility of a stroke in later years by lessening cardiovascular tissue inflammation. By testing a total of 3 different types of cocoa powder in a mock digestive tract composed of " modified test tubes" used to mimic normal digestion, these researchers, " subjected the non-digestible materials to anaerobic fermentation using human fecal bacteria". The main ingredient in chocolate, – the thing that makes chocolate, chocolate – cocoa powder,

contains an abundance of polyphenolic compounds (antioxidants) – catechin and epicatechin being two prominent examples – and dietary fiber in a relatively small amount, both of which are “ poorly digested and absorbed”. Finley then explained that, “ In our study we found that the fiber is fermented and the large polyphenolic polymers are metabolized to smaller molecules, which are more easily absorbed. These smaller polymers exhibit anti-inflammatory activity”. Also, polyphenols found in the stomach may be converted or transformed to reduce inflammation by joining together prebiotics and cocoa powder fiber, increasing one’s overall health. Prebiotics can be defined as complex carbohydrates that cannot be broken down and digested, but the good bacteria in the stomach like to “ eat” them. Finley then went on to say that, “ When you ingest prebiotics, the beneficial gut microbial population increases and outcompetes any undesirable microbes in the gut, like those that cause stomach problems”. This article ended with a note on how dark chocolate could prove to be even more beneficial if combined with things like pomegranate, acai berry or other solid fruits (American Chemical Society, 2014).

As far as how this concept pertains to the things that we have talked about in class this past year, we may need to dive a little deeper into the process than this article goes. Because we have yet to really learn anything about physio-chemistry – which is where a vast majority of these concepts apply – we’re going to have to talk in rather general terms. Considering the fact that the class is termed, “ General Chemistry”, it would seem reasonable to do just that. First things first, we must consider a lab that was done rather early on in the year. While discussing solubility in class, a lab was done in which a

certain solution was suspended in a test tube, combined with another solution and then heated until a solid was produced. This process formed something called a ‘ precipitate’. Precipitate is define in the dictionary as, “ to cause (something solid) to become separated from a liquid especially by a chemical process” (referring to the procedure) or merely as a “ a substance precipitated from a solution” (the solid itself) (Merriam-Webster’s online dictionary, n. d.). The other concept worth taking note of is thermodynamics. We have discussed Gibbs Free Energy in class these past few weeks. This too plays a role.

A. D. McNaught and A. Wilkinson, the compilers of *Compendium of Chemical Terminology, 2nd ed. (the “ Gold Book”)* , refer to a process called Ostwald Ripening – a process in which small, solid particles in a liquid compound are taken out of solution, while the dissolved species residing on the outside of those larger particles undergo redeposition. This process is one of the key underlying contributors to digestion. Food enters the stomach – which is suspended (allowing the effects of gravity) – placed in a solution of hydrochloric acid, potassium chloride, and sodium chloride (gastric acid) (Stewart, 1981), heated by the body, and then, through Ostwald Ripening, the food comes out as a larger, “ purer/cleaner” (American Chemical Society, 2014), precipitated substance . One of the reasons why this process goes over so smoothly is because, “ smaller particles have a higher surface energy, hence higher total Gibbs energy, than larger particles, giving rise to an apparent highersolubility” (McNaught & Wilkinson, 1997).

These concepts are important to take note of, with respect to the article about how great dark-chocolate is for a person’s overall health, because in

order to understand how the chocolate is broken down and absorbed, there needs to be a foundation for how the process works in general. Understanding that the substance will dissociate in the stomach and the essentials for that operation, will open up a better foundation for someone to apprehend what the article was stating. The researchers concluded that chocolate contains two poorly digested materials. After the brief discussion on what digestion is, it can determined that chocolate has certain substances that cannot be precipitated. What then does the body do with what it cannot digest, or break down? Well, the answer according to the article is that they are “ eaten”, fermented, metabolized and then absorbed by bacteria. In the case of cocoa powder, the products of this process have anti-inflammatory properties and can reduce the risk of stroke and stomach problems (American Chemical Society, 2014).

Even though all the information on digestion was not included in this article, I thought what they did include was sufficiently put together, but in my personal opinion, to anyone who isn’t already knowledgeable about the subject in at least some capacity, would walk away from the article thinking nothing more than, “ Sweet, dark-chocolate is good for me. I should eat more of it.” While this article is not necessarily promoting such action, it’s not opposing it either. The information, however, seems to be geared towards those who do, in fact, have an already established foundation for this type of material. I thought that the article was very reader-friendly and tried to give anyone curious enough to read about it a basic overview of the study, but I was ultimately left questioning more than I was before reading it.

Because of what I have learned about thermodynamics, solubility and precipitation, I have to wonder a couple of things. For instance, how do good bacteria “ eat” away the complex carbohydrates and dietary fiber and then ferment it? Is the process drastically different than digestion? What sort of heat is needed for that reaction to occur? I am interested in how, at the end of each process – both digestion and fermentation/metabolization – nutrients from the substance eaten are absorbed. How is the process of events different for each reaction? I have to wonder how these compounds have anti-inflammatory properties after absorption. What do those bacterium do to the dark-chocolate’s components, and ultimately, why isn’t the bacteria digested or fermented? Does it have to do with what reactions occur within the stomach? That would my best guess.

These are all questions that I ask myself now because general chemistry has taught me a lot about reactions, what will react, what won’t and in what capacity. Because of that, I am left wondering more about what it is exactly that is happening in my stomach, not only when I eat dark-chocolate, but any time I put food in my mouth. How does our body know how to process certain foods? This concept is very interesting, and I have general chemistry to thank for that.

Works Cited

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