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The Chemistry Of Chocolate

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Abstract
Chocolate is the one of the most popular food in our society and it is also known as 'food of Gods'. It is made from cocoa beans, derived from cacao tree. Its manufacturing includes roasting, conching, and fermentation, tempering and drying of beans. It contains so many active ingredients but most important ingredient is caffeine. Caffeine is a central nervous system (CNS) stimulant that has several health benefits. Chocolate contains antioxidants (called flavonoids), cocoa butter, caffeine, phenylethylamine, theobromine and psychoactive substances which is responsible for the pleasurable feelings. It has anti – inflammable and anti –oxidants properties. Chocolate has aphrodisiac effect in human body. Chocolate of two types – white chocolate and dark chocolate in which the consumption of dark chocolate is growing rapidly these days because of its health benefits.
Keywords:- *Chocolate, cocoa beans, Phenylethylamine, caffeine, Theobromine, Anandamide, Dark chocolate, white chocolate.*

1- INTRODUCTION

The word "chocolate" is derived from the Classical word *chocolātl*. **Chocolate** word comes from the word "cacao" which is plant. This plant contains the high level of minerals and antioxidants. **Chocolate** is one of the most beloved foods that have usually creamy texture, sweet taste and brown color. It temporarily makes you feel happy. It is prepared by roasted and ground Theobromine cacao seeds which can be made in the form of a liquid or paste. The seeds of cocoa have bitter taste and used as a flavoring ingredient in many other foods. The making of chocolates is the result of long discovery and innovation.

The Swedish botanist, Carolus Linnaeus, renamed the cocoa tree giving it the Greek name Theobroma Cacao in the 18th century. Its botanical name is 'food of the Gods'. For the best growth of cocoa, they need to be shaded from direct sun and wind. It has broad, dark leaves and about 25cm in length.

2- CHEMICALS AND COMPONENTS IN CHOCOLATES

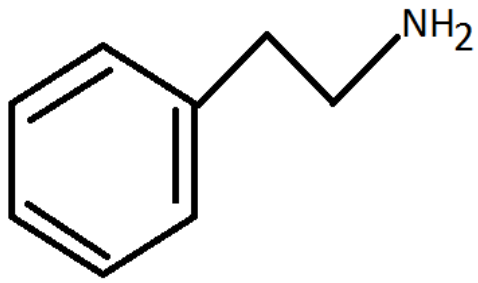
Chocolate contains more than 300-500 known chemicals in which some chemicals are react with human brain and alter their mood. Chocolate includes chemicals like – phenylethylamine (PEA), anandamide, theobromine, caffeine, serotonin, phenolics, xanthenes, histamine, thyphylline etc and components like cocoa butter, sugar, milk powder in which cocoa butter is the most important component. It is the rich source of saturated fatty acid that helps to balance cholesterol in the human body. The chocolate made from cocoa beans, having so many beneficial compounds which lead to good health. It is rich in antioxidant polyphenols. All the chemicals present in chocolates have a deep effect on human brain and also having physiological effect on human body.

2.1- PHENYLETHYLAMINE (PEA)

It is an organic compound having chemical formula $C_8H_{11}N$. It is third prominent

ingredient of chocolate and a natural alkaloid which released by brain when people falling in love. Therefore, it is often referred as Love drug[1]. PEA is kind of amphetamines that found in brain and acts as natural stimulant [2]. It is monoamine that produced by the microbial process or by spoilage of food. It acts as neurotransmitter (help in sending or receiving the signal within the brain) in human central nervous system. It helps out the production of harmones, generates optimistic and pleasurable feelings. It increases the level of dopamine and other nueotransmitter which also helps to generate the aphrodisiac effect on the brain.

Structure –

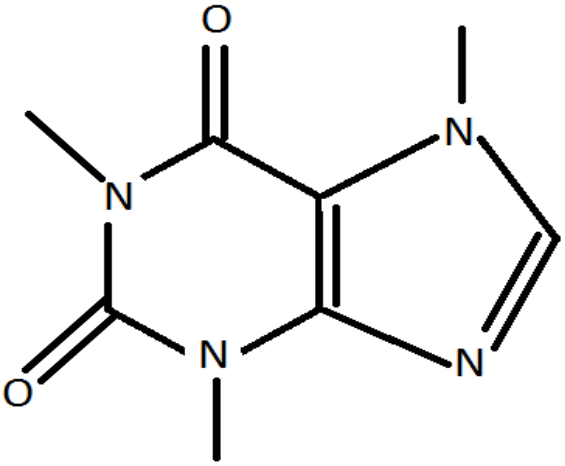


Phenylethylamine

2.2- CAFFEINE

Caffeine is very beneficial for the human health and safe upto a particular limit (300 milligrams or less per day) . It increases the secretion of important neurotransmitter serotonin. It stimulates the central nervous system and flow of blood in brain. This alkaloid decreases fatigue, lifts the spirit and enhances alertness of mind and mood, respiration and cardiovascular function.

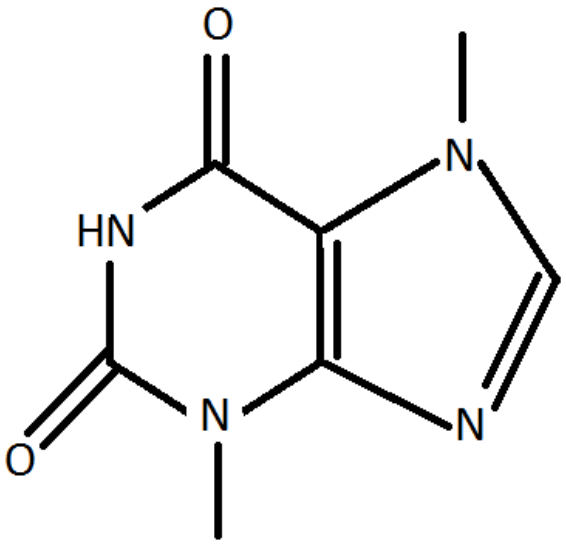
Structure -



2.3- THEOBROMINE

Theobromine is a dimethylxanthine, classified as Xanthine alkaloid. It is white crystalline powder [3], commonly known as Xantheose having chemical formula $C_7H_8N_4O_2$. Theobromine is derived from Theobroma which contain no bromine. It is the bitter alkaloid of cacao plant which naturally occurs in chocolates as well as in the number of plant foods. It is natural cough medicine [4] used as a vasodilator that is used in treating the high blood pressure. It improves the hardness of the surface of tooth enamel, raises the heart rate and have a stimulate effect on human body. It raises the HDL (high – density lipoprotein) cholesterol level [5].

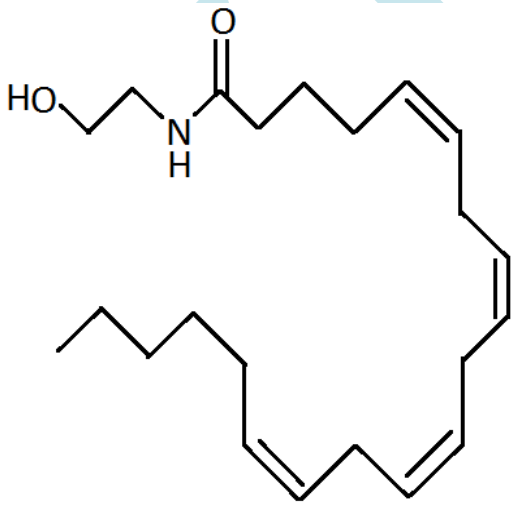
Structure -



2.4- ANANDAMIDE (N-ARACHIDONOYLETHANOLAMINE OR AEA)

Anandamide is the organic compound "endocannabinoid" which found in chocolates at low concentration. It is polysaturated fatty acid having chemical formula $C_{22}H_{37}NO_2$. It is also referred as "Bliss molecule" or "mood – enhancer"[6]. Anandamide name is taken from Sanskrit word "ananada" which means delight, joy or happiness. It has the similar chemical structure as THC (the psychoactive compound in cannabis) that allows the neurons to normal communication with each other. It is the neurotransmitter that naturally produces in the brain to bind to cannabinoid receptors. It exhibits both properties – Anti – anxiety and Antidepressant [7]. It is considered as fragile molecule because it breaks down very easily and quickly. After ingestion, anandamide broke down by the enzyme known as FAAH (fatty acid amide hydrolase). It is responsible for the feeling of happiness that we feel.

Structure –



3- TYPES OF CHOCOLATES

Chocolates are classified into different forms which depends on the quantities of different ingrediants present in it.

3.1- DARK BLACK CHOCOLATE

This is the form of chocolate which contains cocoa solids, cocoa butter, carbohydrates, fats, proteins, sugar and vitamins. The cocoa content and several organic compounds (such as flavanols, catechins, polyphenols) present in dark chocolate contains antioxidants called flavonoids [8]. Dark chocolate is the best source of antioxidants that damage the excessive amount of free radicals in the cells and tissues of the body and neutralize it. The cocoa flavanols is naturally found in cocoa that decreases the risk of heart attack, prevents blood clotting and keep the platelets less sticky [9]. It protects your skin from UV rays coming from sun and increases the blood flow in your body that makes your skin healthier, glowing and wrinkle – free. This is also known as plain chocolate, sour chocolate and black chcocolate. This chocolate is rich in several minerals such as zinc, magnesium, phosphorus, calcium, potassium and iron.

3.2- MILK CHOCOLATE

Milk chocolate is a type of sweet and solid chocolate, made from dark chocolate of low cacao content, higher sugar content[10] additionally contains milk products (may be in the form of boiled milk, condensed milk and milk powder).

3.3 WHITE CHOCOLATE

White chocolate has texture similar to milk and dark chocolate. It contains cocoa butter, sugar lecithin (a fatty emulsifier) and milk soilds, but doesn't contain cocoa soilds. It has slightly yellow color that comes from cocoa butter. It contains good amount of calcium which helps to protect the cardiovascular diseases. It also contains high amount of saturated fat which makes it unhealthy for our body. The regular dose of white chocolate increases the risk of heart disease and diabetes. It increases the cholesterol level, and also leads to weight gain.

Technically, it is not considered as chocolate because it doesn't contain cocoa solids (chocolate solid) and even it doesn't have a taste like chocolate.

Is milk chocolate Healthy?

The milk chocolate contains less amount of cacao powder and high amount of sugar content than dark chocolate. The cacao powder has intense bitter taste but contains nutritious flavonoids. These flavonoids having anti – inflammatory, anti -oxidant properties that provide mood –boosting properties. To reduce the bitter taste of cacao, a lot of sugar added in milk chocolate that decreases the nutritional value of chocolate. Sugar is very calorific, which leads to many health problems. This is in turn leads to an unhealthy weight gain, heart diseases, diabetes and high blood pressure.

Another reason which makes the milk chocolate unhealthy is the addition of high – fat ingredients to make its taste better. The unhealthy saturated fats leads to many diseases like – obesity, cardiovascular disorders and cancer.

4- CONCLUSION

Chocolates have a range of essential ingrediants that has so many health benefits. Cacao, the main ingredient of the chocolate is highly complex food which imparts nutritional properties, antioxidants properties to chocolates. The highest level of the chocolate intake reduces the cardiovascular diseases. The flavonoids present in chocolates helps to repair the injuries and also play an active role of vasodilator. It improves the blood flow and having an impact on our cognitive abilities.

5- REFERENCES

i. https://chem-is-you.blogspot.com/2013/02/the-chemistry-of-chocolate.html.
ii. https://www.reagent.co.uk/the-chemistry-of-chocolate/.
iii. https://pubchem.ncbi.nlm.nih.gov/compound/5429.
iv. https://www.worldofchemicals.com/113/chemistry-articles/chemistry-behind-the-sweet-lure-of-chocolate.html.
v. https://www.nutritionadvance.com/theobromine-benefits/.
vi. https://www.cannabis.info/en/blog/what-is-anandamide-how-does-it-help-marijuana-users.
vii. https://reset.me/story/anandamide-putting-the-bliss-molecule-to-work-for-your-brain/.
viii. https://www.medicalnewstoday.com/articles/324747.php.
ix. https://loseweightbyeating.com/8-health-benefits-dark-chocolate/.
x. https://www.bbcgoodfood.com/glossary/milk-chocolate.