

GREEN TEA (A NATURAL HERB): FUTURE PERSPECTS IN MEDICINE & DENTISTRY

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ABSTRACT

More popular than coffee, stronger than any soft drink and able to start revolution with single drop yes its TEA "GREEN TEA". Green tea grows in tropical and sub-tropical planets. After water, tea is the most widely consumed and popular beverage in the world. It has a cooling, slightly bitter, astringent flavor which many people enjoy and its medicinal properties have been widely explored. Green tea is reported to contain thousands of bioactive ingredients which are almost contributed by polyphenols which plays a key role in prevention and treatment of many diseases.

Keywords: *Green tea*, Anti-oxidants, EGCG, Polyphenols

INTRODUCTION

The Chinese have been consuming *green tea* for four or five thousand years. Old Chinese emperor Shennong regarded father of Chinese medicine and agriculture said to have tested hundred of wild herbs including *Green tea* and thought it was a gift from God. It is being consumed socially, for medicinal purpose and habitually by people since 3000 BC [1]. It became popular in Britain in the 17th century. The use of tea bags was not common until after WWII [2]. The two tea species, 'China type', *Camellia sinensis* and 'Assam type' *C. assamica* originate around Southwest China, Myanmar and Northeast India (Assam), but the native range is obscured by a history of cultivation and introduction by man (Sealy 1958). Europeans obtained tea plants from China in the 18th and 19th centuries and established

plantations in their colonies [3]. Green, Olong and Black tea all comes from leaves of *Camellia sinensis* plant. The plant is a evergreen shrub which is native to southeast asia. China is credited with introducing tea to the world; through the *evergreen tea* plant is infact native to southern China, North India, Myanmar and Cambodia [9]. What sets *green tea* apart is the way it is processed. *Green tea* leaves are steamed, which prevents EGCG compound from being oxidized. In contrast Black and Olong tea are made from fermented leaves, which results in EGCG being converted into other compounds that are not nearly as effective in preventing and fighting various diseases [4]. *Green tea* contains anti-oxidants to help fight free radicals.

TYPES OF TEA

The four types of tea are white, green, oolong, and black tea. Processing of different types of teas is as follows.

(1) White tea: young leaves or new growth buds, withered, uncured, baked dry;

(2) *Green tea*: steamed or dry cooking in hot pans to prevent oxidation; dried tea leaves may be separate leaves or rolled into pellets (gunpowder tea); (3) Oolong tea: withering of leaves under sun and warm winds with further oxidation standard between green and black teas;

(4) Black tea: leaves are completely oxidized, withered, and disrupted or macerated to activate oxidation resulting in catechins being transformed to complex tannins.

(5) Pu'erh tea: This type of tea comes from a large leaf variety of tea plant and can be picked any time of the year. Its processing is similar to that of black tea. What makes this tea unique is that once it is picked; it is piled and aged for as long as 50–100 years.

(6) Rooibos or “Red” tea: It comes from a shrub in South Africa. It is naturally caffeine free— making it a good choice for pregnant or breastfeeding women. Rooibos or Red tea has a high number of antioxidants.

MANUFACTURING OF GREEN TEA

Green tea is made from the top two leaves and buds of a shrub (Fig-1), *Camellia sinensis*, of the family Theaceace and the order Theales. The tea plant originates in an area between India and China

INGREDIENTS OF GREEN TEA

CATHECHINS: Boost health and prevent diseases.

POLYPHENOLS: The major polyphenols in *green tea* are flavonoids. The four major flavonoids in *green tea* are [4]: Epicatechin (EC), Epigallocatechin (EGC), Epicatechin Gallate (ECG), Epigallocatechin Gallate (EGCG).

Contents of polyphenols in *green tea* is 6.0 mmol trolox/kg and in black tea is 3.6. s. High PP intake has allegedly been associated with decreased risks for cancers, cardiovascular diseases and neurodegenerative disorders [6]. Such biological activity has often been evaluated in vitro on pure enzymes, cultured cells, or isolated tissues using food aglycones or glycosides [7,8].

ANTIOXIDANTS: Antioxidants are compounds in foods that neutralise chemicals called free radicals (unstable molecules) produced by oxidation in human body. These chemicals have been linked to disease such as heart and liver disease and cancer. Plants food such as fruit, vegetables, nuts and wholegrains are rich sources of antioxidants. Boost health and prevent diseases.

EPIGALLOCATECHIN GAL-LATE [EGCG] : Very powerful antioxidants in *green tea* that flushes out wastes and other toxins of body. One cup of *green tea* gives more cleansing benefits than eating a serving of fruits or other vegetables.

Catechins and flavonoids are highly effective in:

- Suppressing appetite
- Slowing down carbohydrate absorption
- Increasing basal metabolic rate

VARIOUS EFFECTS OF GREEN TEA (CAMELLIA SINENSIS)

- Health heart and arteries

Green tea is very effective in reducing cholesterol. Drinking a few cups of *green tea* daily reduces risk of heart ailments and diseases. It brings down LDL cholesterol level and preventing any blood clot to form which potentially may lead to stroke and heart attack. Inhibition of proliferation and migration of smooth muscle cells.

Inhibiting the abnormal formation of blood clots (in thrombosis which is leading cause of heart attack and strokes) and reduction of platelet aggregation.

- Look younger

Anti-oxidants and flavonoids contained *green tea* will help people look fresher and younger. People who drink *green tea* daily can slow down the aging process as much as by 50%.

- Fight inflammation and infection

Green tea extract help reduce swelling and inflammation on skin and joints. *Green tea* keeps people protected against bacteria, viruses and fungi.

- Stops cancer

Green tea has the capacity to prevent different types of cancer by as much as 50%-it kills cancer cells without touching and harming the healthy tissues.

Thyroid, Prostate, Breast, Colon, Stomach

HOW FREE RADICALS ARE FORM

Free radicals may play an important role in the origin of life and biological evolution, implicating their beneficial effects on the organisms (Fig-2). The formation of free radicals is a well established physiological events in aerobic cells and non-enzymic resources known as anti-oxident defence to remove this oxidizing species and *green tea* remove these free radicals (Fig-3) without damaging the healthy tissue.

VARIOUS PROSPECTS OF GREEN TEA IN DENTISTRY

Antioxidants (AOs) Increased In Vitro Wound Healing of Nicotine-Treated Oral Fibroblasts: Smoking is associated with increased risk for oral health and dental problems. Treatment with antioxidants (AO) can block the production of reactive oxygen species or block its effects, and might be therapeutically valuable in reducing the risk for

many dental maladies. The aim of this study is to address the hypothesis that nicotine impairs wound healing by inhibiting cell migration, and that AOs may counteract nicotine effects. [5]

Strengthen of teeth: *Green tea* contains antimicrobial molecules called catechins that appear very beneficial to your teeth. Researchers from Columbia University in New York found that men who drank at least one cup of *green tea* a day were 19 percent less likely to have fewer than 20 teeth than men who drank no tea. Women who drank tea daily also benefited with a 13 percent lower risk.

Effects on dental caries: Magalhaes et al in 2009 done an in-situ study on *green tea* extract as a mouth wash and concluded that it protects tooth dentin from erosion and abrasion [10].

Oral Cancers: A human intervention trial examined the effect of treating superficial precancerous lesions (leukoplakia) in the mucosal lining of the mouth with a mixed tea product. After the six-month trial, partial regression of the lesions was observed in 37.9 percent of the group treated with tea as compared to only 10 percent of those treated with a placebo [11].

Researchers examined the effects of tea and curcumin, a spice and food-coloring agent, on oral cancer in hamsters. Hamsters were treated with a topical cancer-causing solution inside the cheek three times a week for six weeks. Two days after the last treatment of the solution, the hamsters were given *Green tea* as drinking fluid or curcumin applied topically three times per week, the combination of *Green tea* and curcumin treatment, or no treatment for 18 weeks. At the end of this period, the scientists observed that the combination of tea and curcumin significantly decreased the number of visible

tumors and tumor volume. Furthermore, tea alone and in combination with curcumin increased cancer cell death (apoptosis) [12].

In Periodontal problems:

Green tea also shown to be highly effective in maintaining clean and strong tooth. Its anti-bacterial agents also prevent tooth decay, bad breath and gingivitis.

Plenty of studies have suggested that tea is a boon for cardiovascular health, but new research has found that adding milk to your favorite brew negates those benefits.

The culprits in milk is a group of proteins called caseins that interact with tea, decreasing the concentration of catechin -- the flavonoids in tea that are responsible for its protective effects against heart disease, according to the study authors.

Nanoparticles

Nanotechnology has emerged as a promising technology that has been advocated for the delivery of antimicrobial phenolic extracts. There have been some recent efforts to enhance its bio-availability by delivering EGCG using lipid nano-capsules and liposome encapsulation, suggesting the possibility of this molecule being developed further by medicinal chemists.

Synthesis of nanoparticles using biological entities has great interest due to their unusual optical[13], chemical[14], photo-electrochemical[15], and electronic properties[16]. Various techniques including chemical and physical means have been developed to prepare metal nanoparticles. In most cases the surface passivator reagents are needed to prevent nano-particles from aggregation. Unfortunately many organic passivator such as thiophenol, thiourea, mercaptoacetate, etc are toxic enough to pollute the environment if large scale nanoparticles are produced from them.[17,18]

Effects on HIV

A recent study appearing in the Journal of Allergy and Clinical Immunology stated that EGCG found in *green tea* can help to boost one's immune system, therefore helping to prevent HIV. The EGCG prevents the binding of HIV to human T-cells, the first step in HIV infection. One study [19] demonstrated that EGCG inhibited the binding of human immunodeficiency virus (HIV) to human CD4 (+) lymphocytes, which is a crucial step in HIV infection. For infection to develop, the viruses need entry into CD4 (+) lymphocytes through a step dependent on adhesion to the CD4 molecule and subsequent intracellular viral proliferation[20]. Epigallocatechin gallate showed a strong affinity for CD4 and, by binding them, could effectively inhibit the binding of the HIV envelope (gp120). This data opens new perspectives for the treatment of this life-threatening disease. Additional research is necessary for the clinical application of EGCG as an anti-HIV drug [21].

Magalhaes et al. found that mouth rinsing with *green tea* extract (0.61%) protected from erosion and abrasion of the tooth dentine similarly to mouth rinsing with fluoride extract (250 ppm) or chlorhexidine extract (0.06% as found in oral hygiene products)[10].

Among oral diseases like dental caries, periodontal disease, and tooth loss dental caries is a multifactorial infectious disease in which nutrition, microbiological infection, and host response play important roles. *Streptococcus mutans* is mainly responsible for causing dental caries. *Green tea* has proved to have anti-*Streptococcus mutans* activity[21]A study has uncovered yet another benefit of *green tea* consumption. It has been found that routine intake of *green tea* may also help in fighting against these oral diseases. It promotes healthy teeth and

gums. The study analyzed the periodontal health of 940 men, and found that those who regularly drink *green tea* had superior periodontal health[22].

Apart from their polyphenols content, green is a natural source of fluoride and an effective vehicle for fluoride delivery to the oral cavity. The mean fluoride concentration in *green tea* is ~ 2.1 ppm, which lies within the acceptable daily intake [3]. According to a report, after cleansing the mouth with tea, approximately 34% of the fluoride is retained and shows a strong binding ability to interact with the oral tissues and their surface integuments [23]. This fluoride content

WHY SHOULD DRINK GREEN TEA

- It fights with free radicals producing cancer.
- It lowers cholesterol.
- Prevent cavities in mouth.
- Protects against cardiovascular diseases.
- Speed up metabolism
- Prevents diabetes
- Act as Anti-viral and anti-bacterial agent
- It maintains a healthy circulatory system
- It strengthen periodontia and enamel of tooth
- It helps to reduce plaque and bacterial growth in mouth
- Enriched with antioxidants
- Gives a healthy skin and stops aging
- For good vision
- Prevents hair loss
- Helps combat obesity

CONCLUSION

Not all of these are backed up by sufficient scientific studies; just yet its effect on lowering the risk of heart disease has already been strengthened.

However like any stuff that is when consumed excessively may have downsides, tea is not exception to that. Every tea contains caffeine and it stimulates central nervous system. It is widely to known to have couple of side effects when consumed in large doses.

may have a beneficial impact on caries and may carry out a wide range of biological activities including prevention of tooth loss and oral cancer [24].

A recent study suggests that there is an explicit association between the consumption of *green tea* and oral health. It is also evident that *green tea* products have been used for preventing and treating several oral and periodontal diseases.[3,25]. Its frequent consumption greatly reduces bad breath(Halitosis).

Knowing the role of periodontopathic bacteria in producing volatile sulfur compounds, antimicrobial polyphenols in *green tea* can improve bad breath by suppressing these bacteria[26].

It is recommended to avoid taking caffeine beyond 500 mg a day to avoid these side effects:

Insomnia, Nervousness, Restlessness, Irritability, Headache and Anxiety.

Large consumption of caffeine may also lead to gastrointestinal problems, irregular heartbeats and muscle tremors.

Though *Green tea* is not known and famous herb as treatment of various diseases, but it is one the most researched plant based remedy from ancient times whose possible benefits include cancer prevention, stops aging, cardio-vascular health, skin protec-

tion and anti-oxidant to fight high cholesterol level, impaired immune system, and many dental problems.

REFERENCES

1. A.B. Sharangi. Medicinal and therapeutic potentialities of tea (*Camellia sinensis* L.) – A review. Food Research International 42 (2009); 529–535.
2. Gerry Schwalfenberg, Stephen J. Genuis, and Ilia Rodushkin. The Benefits and Risks of Consuming Brewed Tea: Beware of Toxic Element Contamination. Journal of Toxicology .Volume 2013;8 pages.
3. Anand Jigisha, Rai Nishant, Kumar Navin, and Gautam Pankaj. *Green tea: A magical herb with miraculous outcome.* International research journal of pharmacy;2012,3(5);139-148
4. Hicks A. Review of global tea production and the impact on industry of the asian economic situation. AUJ.T 2001;(5)2.
5. V. R. Sinija, & H. N. Mishra, *Green tea: Health benefits;* journal of nutritional & environmental medicine; December 2008; 17(4): 232–242
6. Stefano Petti ,Crispian Scully. Polyphenols, oral health and disease: A review. journal of dentistry 37 (2009); 413–423
7. Manach C, Scalbert A, Morand C, Remesy C, Jimenez L. Polyphenols: food sources and bioavailability. American Journal of Clinical Nutrition 2004;79:727–47.
8. Liu Z, Hu M. Natural polyphenol disposition via coupled metabolic pathways. Expert Opinion on Drug Metabolism and Toxicology 2007;3:389–406.
9. Symone M San Miguel, Lynne A. Opperman and Kathy K. Svobod. Antioxidants(AOs) Increased In Vitro Wound Healing of Nicotine-Treated Oral Fibroblasts; *FASEB J.*April 2010;24 (Meeting Abstract Supplement) 181.2
10. Magalhaes AC, Wiegand A, Rios D, Hannas A, Attin T, Buzalaf MA. Chlorhexidine and *green tea* extract reduce dentin erosion and abrasion in situ. J Dent 2009;37(12):994–8
11. Li N, Zheng S, Han C, Chen J. The Chemoprotective Effects of Tea on Human Oral Precancerous Mucosa Lesions. Proc Soc Exp Biol Med 1999;220:218-24.
12. Li N, Chen X, Liao J, Yang G, Wang S, Josephson Y, Han C, Chen J, Huang MT, Yang CS. Inhibition of 7,12-dimethylbenz[a]anthracene (DMBA)-induced oral carcinogenesis in hamsters by tea and curcumin. Carcinogenesis 2002;23(8):1307-13.
13. Lin S M, Lin F Q, GUO H Q, Zhang Z.H ,Wang ZG. Surface states induced photoluminescence from Mn²⁺ doped cds nano—particles; *Solid State Commum* 2000 ; 115:615–618
14. Krolikowska A, Kudelski A, Michota A , Bukowska J. SERS studies on the structure of thioglycolic acid monolayers pn silver and gold *Surf Sci* 2003 ; 532:227-232
15. Ahmad A, Senapati S, Khan MI, Kumar R, Sastry M. Extracellular biosynthesis of monodisperse gold nanoparticles by a novel extremophilic actinomycete, *Thermomonospora* sp. Langmuir 2003; 19:3350-3553.
16. Chandrasekharan N, Kamat PV. Improving the photo-electrochemical

- performance of nanostructured TiO₂ films by adsorption of gold nanoparticles. *J Phys Chem B* 2000 ; 104:10851-10857
17. Ravindran TR, Arora AK, Balamuragan B, Mehta BR. Inhomogeneous broadening in the photo luminescence spectrum of cds nanoparticles. *Nanostruct. Mater* 1999; 11:603-609.
 18. Gericke M and Pinches A. Biological synthesis of meta Nanoparticles. *Hydrometallurgy* 2006 ; 83:132-140
 19. Nance CL, Shearer WT. Is *green tea* good for HIV-1 infection? *J Allergy Clin Immunol* 2003;112:851-3
 20. Kuriyama S. *Green tea* may do wonders for brain. *Am J Clin Nutr* 2006;83:355-61
 21. Naderi N Jalayer, Niakan M, Kharazi Fard M J and Zardi S Antibacterial Activity of Iranian Green and Black Tea on *Streptococcus Mutans*: An In Vitro Study. *J Dent (Tehran)*. Spring2011; 8(2): 55-59.
 22. Kushiyama Mitoshi, Shimazaki Yoshihiro, Murakami Masatoshi, and Yamashita Yoshihisa.. Relationship between Intake of *Green tea* and Periodontal Disease. *Journal of Periodontology* 2009; 80(3): 372-377.
 23. Simpson A, Shaw L, Smith AJ. The bio-availability of fluoride from black tea. *J Dent* 2001; 29:15-21.
 24. Okamoto M, Sugimoto A, Legun KP, Nakayama K, Kamaguchi A, Maeda N. Inhibitory effect of *green tea* catechins on cysteine proteinases in *Porphyromonas gingivalis*. *Oral Microbiol Immunol* 2004; 19:118-120.
 25. Hamidreza A, Ahmad M, Shayan, G, Hooman S, Keyvan S, Ali F. Review of The therapeutic effects of *Camellia sinensis (green tea)* on oral and periodontal health. *Journal of Medicinal Plants Research* 2011; 5(23): 5465-5469.
 26. Venkateswara Babu, Sirisha K and Chava Vijay K. *Green tea* extract for periodontal health. *J Indian Soc Periodontol* 2011; 15(1): 18-22.

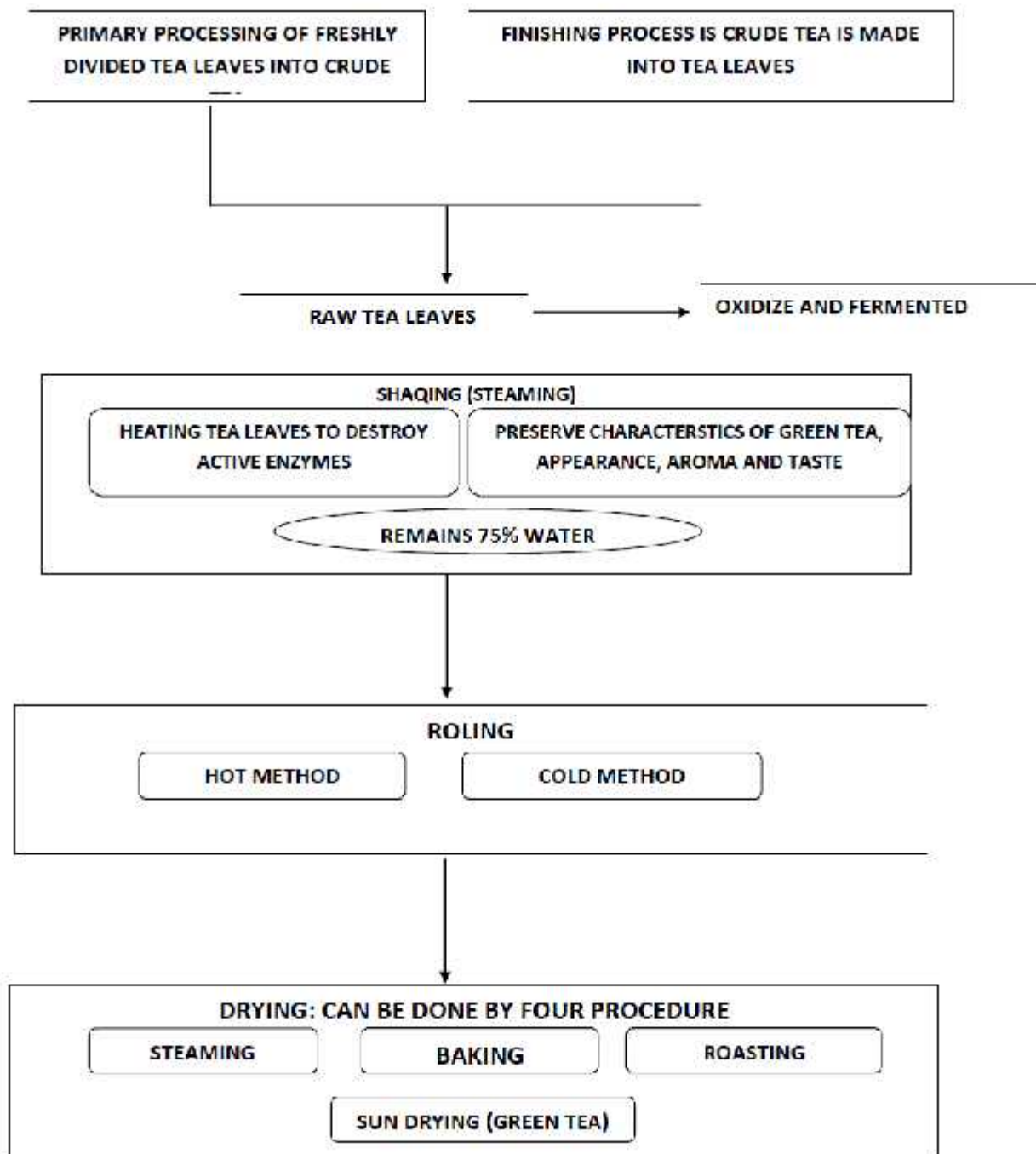


FIG 1: MANUFACTURING OF GREEN TEA

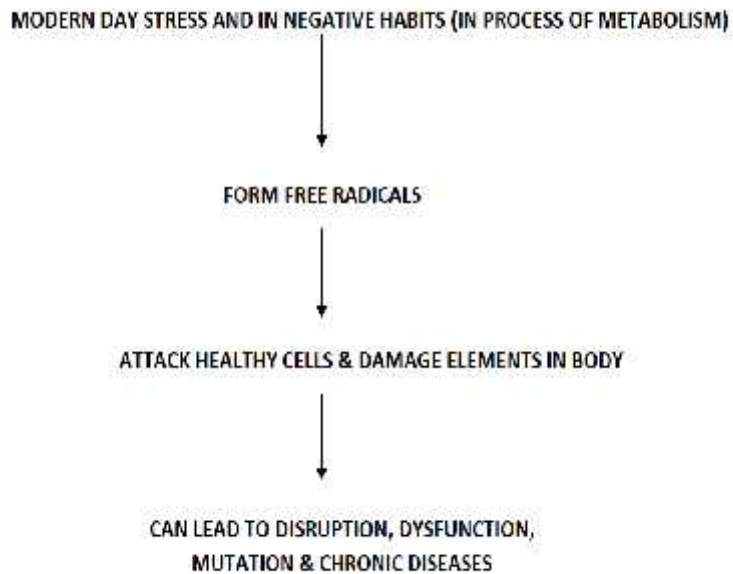


FIG 2: HOW FREE RADICALS ARE FORM

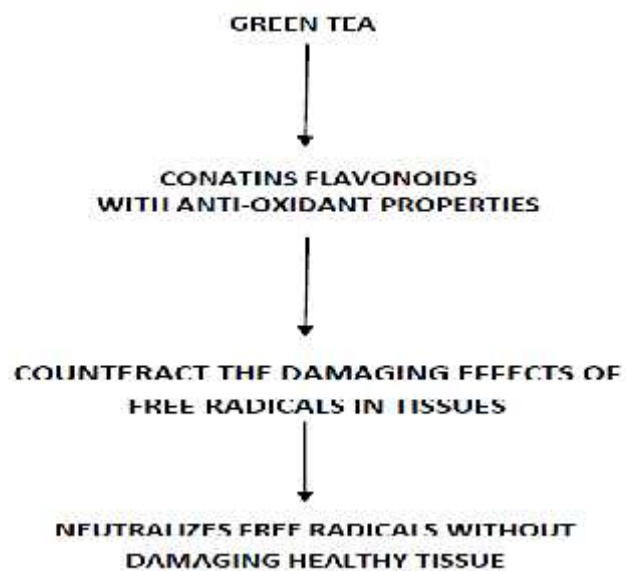


FIG 3: HOW GREEN TEA WORKS

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