

TEA HEALTH & WELLNESS TIPS

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BLACK TEA HEALTH and WELLNESS NOTES

- Black tea comes from the same plant as green and white teas, (*Camellia Sinensis*) and is an excellent source of antioxidants and polyphenols;
- Antioxidants and tea polyphenols are documented in various research papers as inhibitors of various types of cancers in some cases;
- A Dutch study published by the American Journal of Clinical Nutrition found that the risk of heart attack in people who drank 3 or more cups of black tea per day was 1/2 that of non-black tea drinkers. The study also found that the risk of dying from a heart attack, if they had one, was reduced by 1/3rd.* ;
*(Geleijnse, Johanna M et al. Inverse association of tea and flavonoid intakes with incident myocardial infarction: the Rotterdam Study. Am J Clin Nutr 2002;75:880-86.)
- In laboratory tests results noted that premium black teas grown at high altitude generally contained more antioxidants compared to low altitude common green teas;
- A cup of tea consumed without milk or sugar or any other additives contains no calories;
- Recently (since 2008) research has been done that indicates black tea can be consumed for reducing the risk of heart attack and kidney stones: a dose of at least one cup per day;
- Recently (since 2008) research has been done that indicates black tea can be consumed for preventing "hardening of the arteries" (atherosclerosis), 125-500 mL (1-4 cups) of brewed black tea daily;
- Some doctors suggest putting wet black tea bags on canker sores. Black tea contains tannin, a substance that can relieve pain;
- Drinking black tea throughout the day helps to keep people alert, even after extended periods without sleep;
- Women who drink black tea seem to have an 8% lower risk of developing kidney stones;
- Women, who regularly drink tea, including black tea or green tea, appear to have a significantly lower risk of developing ovarian cancer compared to women who never or seldom drink tea;
- There is some evidence from large-scale studies that people who drink caffeinated beverages such as coffee, tea, and cola have a decreased risk of Parkinson's disease. For men, the effects seem to be dose-related. However, there seems to be a significant reduction in risk even with consumption of as little as 124-208 mg (4-8 cups of tea) caffeine per day. Drinking black tea also appears to reduce the occurrence of Parkinson's disease among people who smoke;
- In combination with various other products, black tea is used for weight loss;
- So far (Jan. 2011) there is some evidence that drinking black tea might be linked to stronger bones in women aged 65-76 years. Drinking black tea also seems to be associated with a lower risk of hip fracture in men and women who are older than 50;
- There is evidence that men who get more chemicals called phytoestrogens in their diet have up to a 27% lower risk of developing lung cancer than men who do not get these chemicals. Green tea and black tea contain phytoestrogens;
- In a double blind, randomised study in which hypertensive men drank one cup of black tea daily, both systolic and diastolic blood pressure was reduced. The blood pressure lowering effect was maintained even after a large intake of fatty, sugary food, which usually constricts blood vessels, showing that "cardiovascular protection can be achieved even without much sacrifice and with normal intakes". Healthier blood vessels create better blood flow, which means all of your organs, including the brain, are receiving more blood, oxygen and nutrients, enhancing your body's ability to fight disease. So healthier blood vessel linings might be one reason why tea consumption seems associated with so many benefits;

References: 1. Claudio Ferri, Professor at Italy's University of L'Aquila School of Internal Medicine and co-author of the study

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Black Tea linked to a reduced risk of Ovarian Cancer

- Abstract no: International Journal of Gynecological Cancer. 2007

According to latest research from America¹, black tea has been found to reduce the possible risk of ovarian cancer. The study which was carried out with 414 subjects, found that women drinking two or more cups of black tea a day, had a 30% reduction in risk of ovarian cancer. Commenting on this latest research, Dr Catherine Hood from the Tea Advisory Panel notes: "This latest research data from America is great news for all tea drinkers. The findings are also supported by a Swedish study, where data has demonstrated that black tea could have a protective effect in ovarian cancer². Dr Hood adds: "This Swedish study, which involved over 61,000 women, found that women who drank two or more cups of tea a day had a 46% reduced risk of ovarian cancer compared with women who never or seldom drank tea." Each additional cup of tea was associated with an 18% lower risk of ovarian cancer, indicating that tea consumption may be associated with reduced risk of ovarian cancer in a dose-dependent manner."

References: 1. Baker JA, Boakye K, McCann SE, Beehler GP, Rodabaugh KJ, Villella JA, et al. Consumption of black tea or coffee and risk of ovarian cancer. *Int J Gynecol Cancer* 2007;17(1):50-4. 2. Tea Advisory Panel – UK Tea Council

Tea heart health benefits clear

- Literature Review – Tea Advisory Panel – UK Tea Council. May 2009.

Drinking at least four cups of tea a day cuts the risk of a heart attack, keeps your body's hydration needs at a healthy, optimum level, and improves your alertness and mood elevation, according to a major literature review, commissioned by the Tea Advisory Panel (TAP). What's more, tea could play a positive contribution to bone mineral density, disproving some earlier suggestions that the caffeine and fluoride in the drink may have an adverse effect on bone health. In the literature study, leading independent dietician and member of the Tea Advisory Panel, Dr Carrie Ruxton reviewed all the existing scientific literature on black tea. The results are published in next month's *British Nutrition Foundation's Nutrition Bulletin* (June). Clinical studies reveal that natural plant antioxidants found in tea, called polyphenols, have beneficial effects on many biochemical processes in the body via a range of mechanisms. Dr Ruxton's study shows clearly that drinking tea can reduce the risk of a heart attack. It also concludes that adding milk doesn't change the effectiveness of the polyphenols. Commenting on her review paper, Dr Ruxton from TAP notes: "The clearest consistent evidence points to an association between tea consumption, in excess of 3 cups per day, and a reduced risk of myocardial infarction (heart attack), great news for the many of us that are avid drinkers of tea. "My study also found emerging evidence that older women – those most at risk of brittle bones - had „significant“ increases in bone density if they drank more than four cups of tea a day. "It is clear that tea is worthy of further research and, in the meantime, can be enjoyed within the optimal intake range of 3 to 8 cups per day."

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Antioxidant rich black tea confers health benefits to diabetics

- Nutrition Research Newsletter, Sept, 2009

It is estimated that about 24 million people in the United States are diabetics, which is equal to 8% of the total population, and about 19 million people are affected by diabetes in EU, which is 4% of the total population. According to the Diabetes Association figures drawn for the period 2005 to 2007, it is suggested that the total costs was estimated to be \$174 billion with \$116 billion contributing to the direct costs from medication. This figure suggests the rise in the incidence of diabetes among the people and the rising healthcare expenditure. A team of researchers Tianjin University led by Haixia Chen through their study suggest that polysaccharides from black tea may be more effective in dampening the spikes in the sugar levels after a meal, when compared to the other similar compounds such as green tea, oolong tea, thus proving to be a potential alternative for the management of diabetes. The polysaccharides present in black tea are believed to possess scavenging properties that hunts for free radicals, which are associated with the development of a number of diseases such as cancer, rheumatoid arthritis. and the like. Over the recent years, tea and its components are being researched and a number of research studies have been conducted on tea focusing on the polyphenol content. This suggests the growing interest among the researchers and the consumers. Green tea contains about 30% to 40% water-extractable polyphenols and black tea contains about 3% to 10% polyphenols. This study aims at studying the polysaccharide content of the green, black, and oolong tea and the individual's ability to inhibit the effects of alpha-glucosidase activity. Inhibiting the activity of this carbohydrate hydrolyzing enzyme, it may be possible to ease the spike in glucose levels in the blood following a meal. In this study, the researchers isolated three polysaccharide-rich portions from green, black, and oolong tea. According to the researchers, black tea was found to contain lower molecular weight polysaccharides, where they weighed around 3.8 to 32.7 KDa; green tea contained polysaccharides that weighed around 9.2 to 251.5 KDa. The teas were assessed for their ability to inhibit the activity of alpha-glucosidase and potent anti-oxidant activities relating to hydroxyl and DPPH radicals. The researchers conclude that black tea's polysaccharides was found to exhibit excellent results in terms of their ability to inhibit alpha-glucosidase and their antioxidant properties, that confers the ability to scavenge for free radicals. The researchers suggest that the differences in the polysaccharide rich portions may be associated with the differences in the monosaccharide composition and molecular weight of the polysaccharides.

References: Toni Naganuma, Division of Epidemiology, Department of Public Health and Forensic Medicine, Tohoku University School of Medicine, 2-1 Seiryomachi Aoba-ku, Sendai, 980-8575 Japan.

Antioxidative and anti-carcinogenic activities of tea polyphenols

- Abstract no: Arch Toxicology 2008 Nov 12.

Tea (Camellia Sinensis, Theaceace), a popular beverage consumed world-wide, has been studied for its preventive effects against cancer as well as cardiovascular, neurodegenerative, and other diseases. Most of the proposed beneficial effects have been attributed to the polyphenolic compounds in tea, but the nature of these activities and the molecular mechanisms of their actions remain unclear. Tea polyphenols are known to be strong antioxidants. Prevention of oxidative stress, modulation of carcinogen metabolism, and prevention of DNA damage have been suggested as possible cancer preventive mechanisms for tea and tea polyphenols. In this chapter, we discuss these topics in the light of biotransformation and bioavailability of tea polyphenols. We also review the preventive effects of tea polyphenols in animal models of carcinogenesis and some of the possible post-initiation mechanisms of action. Finally, we discuss the effects of tea consumption on cancer risk in humans. It is our aim to raise some of the unanswered questions regarding cancer prevention by tea and to stimulate further research in this area.

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Tea, Coffee and Prostate Cancer

- Abstract no: Mol Nutr Food Res. 2008 Nov 4.

Worldwide, prostate cancer has the second highest incidence of all cancers in males with incidence and mortality being much higher in affluent developed countries. Risk and progression of the disease may be linked to both genetic and environmental factors, especially dietary factors. Tea and coffee are two of the most popular beverages in the world and have been investigated for possible effects on health outcomes, including cancer. However, very little dietary advice for their consumption exists. The evidence for a relationship between coffee or tea consumption and prostate cancer is reviewed in this paper. While current evidence indicates that coffee is a safe beverage, its consumption probably has no relationship with prostate cancer. Tea, especially green tea, has shown some potential in the prevention of prostate cancer. While evidence from epidemiologic studies is currently inconclusive, strong evidence has emerged from animal and in vitro studies. We also consider what level of evidence is required to make recommendations for preventive measures to the public. Although evidence on the relationship between coffee, tea and prostate cancer is not complete, we consider it strong enough to recommend tea as a healthier alternative to coffee.

Theaflavins from Black Tea, Especially Theaflavin-3-gallate, Reduce the Incorporation of Cholesterol into Mixed Micelles

- Abstract no: J. Agric. Food Chem., 2008, 56 (24), pp 12031–12036

Tea is one of the most widely consumed beverages in the world and may be associated with reduced heart disease rates. Theaflavins, which are formed in the production of black tea, has been suggested being responsible for the blood-cholesterol-lowering (BCL) effects of tea. We hypothesized that the effect of theaflavins on BCL could be through interference in the formation of dietary mixed micelles, which could result in reduced intestinal cholesterol absorption. Micelles were produced by mixing oleic acid, bile acids, lyso-phosphatidylcholine, and cholesterol. Theaflavin-treated micelles/particles were analysed using electron microscopy (cryo-TEM), high-performance liquid chromatography (HPLC) analysis, and light-scattering particle size measurements. A dose-dependent inhibitory effect of theaflavins on the incorporation of ¹⁴C-labeled cholesterol into micelles and a theaflavin-dependent increase in particle size was found. These particles consisted of insoluble large multilamellar vesicles with onion-like structures. Ultracentrifugation and HPLC analysis revealed that the pellets contained mainly theaflavin-3-gallate, while the remaining theaflavins were found to be present in the supernatant. Using purified theaflavin subtypes confirmed that mainly theaflavin-3-gallate is responsible for multilamellar vesicle formation. These results show that theaflavins can play a role in decreased intestinal cholesterol absorption via inhibition of micelle formation.

Black tea polyphenols mimic insulin/insulin-like growth factor-1 signalling to the longevity factor FOXO1a

- Abstract No: Aging Cell, 7 (1) pp. 69-77, 2008

In vertebrates and invertebrates, relationships between diet and health are controlled by a conserved signalling pathway responsive to insulin-like ligands. In invertebrate models for example, forkhead transcription factor family O (FOXO) transcription factors in this pathway regulate the rate of aging in response to dietary cues, and in vertebrates, obesity and age-induced deficits in the same pathway are thought to contribute to dysregulation of hepatic gluconeogenesis through genes such as phosphoenolpyruvate carboxykinase (PEPCK). Recently, we have begun to screen for dietary constituents capable of regulating this pathway in our cell culture model. Here, we identify three black tea theaflavins, theaflavin 3-O-gallate, theaflavin 3''-O-gallate, theaflavin 3,3''-di-O-gallate and thearubigins as novel mimics of insulin/IGF-1 action on mammalian FOXO1a, PEPCK and moreover we provide evidence that the effects on this pathway of the green tea constituent (-)-epigallocatechin gallate depend on its ability to be converted into these larger structures. With the exception of water, tea is the most popular drink globally, but despite this, little is known about the biological availability of black tea polyphenols in vivo or the molecular target(s) mediating the effects presented here.

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Tea, flavonoids, and nitric oxide-mediated vascular reactivity

- Abstract no: J Nutr. 2008 Aug;138(8):1554S-1560S.

Epidemiological evidence supports the concept that diets rich in fruits and vegetables promote health and attenuate or delay the onset of cardiovascular disease (CVD). Although a variety of factors contribute to the beneficial effects of plant foods, much attention has been addressed to plant polyphenols. In this regard, in the daily Western diet, both black and green teas contribute to a relevant proportion of total phenol intake. The more abundant class of flavonoids that is present in teas is represented by flavanols, i.e., catechin, epicatechin, epigallocatechin, epicatechin gallate, and epigallocatechin gallate. Studies using animal models of atherosclerosis indicate that dietary flavonoid consumption delays atherosclerotic plaque development. Accordingly, an inverse association between tea intake and CVD has been demonstrated. Further, flavonoids can reduce endothelial dysfunction, i.e., the key step in the development of atherosclerosis. Concordantly, human data suggest that tea may reduce blood pressure levels. Despite this, although they often show that tea may have cardiovascular protective effects, results from epidemiological studies exploring the association between tea and health are controversial. Conflicting results may be caused by disparate study designs and flavonoid contents in different kinds of tea. Thus, because tea is a popular beverage worldwide, and several studies have shown that it is protective against CVD, further studies are needed to determine the role of tea in primary and secondary cardiovascular prevention.

Effects of black and green tea consumption on blood glucose levels in non-obese elderly men and women from Mediterranean Islands (MEDIS epidemiological study)

- Abstract no: Eur J Nutr. 2008 Feb;47(1):10-6.

Obesity and diabetes are metabolic disorders that affect a large amount of the elderly population and are related to increased cardiovascular risk. **BACKGROUND:** Obesity and diabetes are metabolic disorders that affect a large amount of the elderly population and are related to increased cardiovascular risk. Tea intake has been associated with lower risk of mortality and morbidity in some, but not all studies. We evaluated the association between tea intake, blood glucose levels, in a sample of elderly adults. **METHODS:** During 2005-2006, 300 men and women from Cyprus, 142 from Mitilini and 100 from Samothraki islands (aged 65-100 years) were enrolled. Dietary habits (including tea consumption) were assessed through a food frequency questionnaire. Among various factors, fasting blood glucose and body mass index (BMI) were measured. **RESULTS:** Fifty-four percent of the participants reported that they consume tea at least once a week (mean intake 1.6 +/- 1.1 cup/day). A significant interaction was observed between tea intake, obesity status on glucose levels ($P < 0.001$). After adjusting for various confounders, tea intake was associated with lower blood glucose levels in non-obese (P for trend < 0.001), but not in obese people ($P = 0.24$). Multiple logistic regression analysis revealed that moderate tea consumption (1-2 cups/day) was associated with 88% (95% CI 76-98%) lower odds of having diabetes among non-obese participants, irrespective of age, sex, smoking, physical activity status, dietary habits and other clinical characteristics. **CONCLUSION:** Tea consumption is associated with reduced levels of fasting blood glucose only among non-obese elderly people.

Dietary flavonoid intake and lung cancer-A population-based case-control study

- Abstract no: Cancer. 2008 Mar 7

Laboratory studies suggest that flavonoids are antimutagenic and anticarcinogenic. **BACKGROUND:** Laboratory studies suggest that flavonoids are antimutagenic and anticarcinogenic. To investigate the associations between commonly consumed flavonoid compounds and lung cancer, the authors conducted a population-based case-control study of 558 lung cancer cases and a group of 837 controls. **METHODS:** Dietary intakes of flavonoids were estimated by combining the intake frequency (collected by a food frequency questionnaire), portion size, and food composition data. Unconditional logistic regression analysis was used to estimate odds ratios (ORs) and 95% confidence limits (95% CLs) with an adjustment for potential confounders, including age, sex, race-ethnicity, years of schooling, smoking status, pack-years of tobacco smoking, and daily energy intake. **RESULTS:** Lung cancer was associated inversely with the consumption of epicatechin (in 10 mg per day increment: OR, 0.64; 95% CL, 0.46-0.88), catechin (4 mg per day increment: OR, 0.49; 95% CL, 0.35-0.70), quercetin (9 mg per day increment: OR, 0.65; 95% CL, 0.44-0.95), and kaempferol (2 mg per day increment: OR, 0.68; 95% CL, 0.51-0.90) among tobacco smokers. There was little association between lung cancer and the flavonoid compounds mentioned above among nonsmokers. Regardless of smoking status, there was little association with total flavonoids: thearubigins, hesperetin, naringenin, and myricetin. In addition, consumption of vegetables, tea, and wine, all of which are rich sources of flavonoids, was associated inversely with lung cancer among

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tobacco smokers. **CONCLUSION:** Certain flavonoid compounds, including epicatechin, catechin, quercetin, and kaempferol, was associated inversely with lung cancer among tobacco smokers, but not among nonsmokers. Further studies of these associations may be warranted.

Black tea represents a major source of dietary phenolics among regular tea drinkers.

- Abstract No: Free radical research, 2002 Oct, 36(10):1127-1135

The phenolic composition and antioxidant activities [TEAC, ORAC, FRAP] of consumer brews (1 tea bag in 230 ml for 1 min) of seven different brands of black tea from the British market were investigated. The main phenolic compounds identified were epigallocatechin gallate, four theaflavins, as well as epicatechin gallate, theogallin (tentative assignment), quercetin-3-rutinoside and 4-caffeoyl quinic acid. Thearubigins represented an estimated 75-82% of the total phenolics. Further, polyphenol fractions were in decreasing order theaflavins, flavan-3-ols, flavonols, gallic acids and hydroxycinnamates. On average, a cup of a consumer brew of black tea is providing polyphenols at the level of 262mg GAE/serving, of which 65 mg were assigned to individual polyphenols. The antioxidant activity of black tea preparations is higher than that of most reported dietary agents on a daily basis. Correlations were observed between the antioxidant activities and the sum of all quantified polyphenols by HPLC analysis as well as with the total phenolics. Treatment of the black tea brew with simulated gastric juice resulted in a significant increase of the identified theaflavins implying a partial cleavage of thearubigins in the environment of the gastric lumen. Therefore, black tea can be considered to be a rich source of polyphenols and/or antioxidants.

Antidiarrhoeal activity of Sri Lankan Dust grade Black Tea (*Camellia sinensis* L.) in mice

- Abstract no: PHARMACOGNOSY MAGAZINE, vol.5, no. 18, pp. 115-121, 2009

This study examined the antidiarrhoeal potential of Sri Lankan black tea (*Camellia sinensis*) in mice using high grown unblend Dust grade No: 1 tea. Different concentrations of black tea brew (BTB) [84 mg/ml (equivalent to 1.5 cups), 167 mg/ml (equivalent to 3 cups), 501 mg/ml (equivalent to 9 cups) or 1336 mg/ml (equivalent to 24 cups)], or a high concentration (equivalent to 9 cups) of green tea brew (GTB) of Chinese and Japanese types or reference drug, loperamide (10 mg/kg) were orally administered to different groups of mice (N = 9-12/group) and were subjected to two antidiarrhoeal tests: normal defecation test and castor oil-induced diarrhoea test. The results show that BTB of Sri Lankan Dust grade tea dose-dependently and markedly decreased the number of faecal boluses produced in the normal defecation test and improved the severity of the diarrhoeal condition in the castor oil-induced diarrhoea test. However, the antidiarrhoeal effect of BTB was superior to Japanese type of GTB and inferior to loperamide. BTB also prolonged the gastrointestinal transit time, impaired intestinal fluid secretion, increased intestinal fluid absorption and reduced in vitro nitric oxide production. It is concluded that Sri Lankan black tea possesses marked antidiarrhoeal activity supporting the folkloric claim that Sri Lankan black tea is a good remedy for acute non specific diarrhoea.

The efficacy of black tea in ameliorating endothelial function is equivalent to that of green tea

- Abstract No: British Journal of Nutrition, 99 (4) pp. 863-868, 2008

Consumption of tea has been shown to improve endothelial function. It is assumed that catechins are the tea components responsible for these beneficial effects. In black tea, catechin concentrations are significantly lower than in green tea. The present study was designed to compare green and black tea with regard to amelioration of endothelial function. Endothelial function in response to both teas was assessed in bovine aortic endothelial cells (BAEC) and rat aortic rings. To elucidate whether these findings are also applicable to humans, flow-mediated dilation (FMD) and nitro-mediated dilation (NMD) were assessed by ultrasound in twenty-one healthy women before and 2 h after consumption of green and black tea (2 h of FMD and NMD), in comparison with water (control). In BAEC, green and black tea significantly increased endothelial NO synthase activity to the same extent. Similarly, both teas induced comparable endothelial-dependent vasodilation in rat aortic rings. In human subjects, ingestion of green and black tea led to significant increases in FMD: from 5.4 (sd 2.3) to 10.2 (sd 3) % (baseline-adjusted difference (BAD) for 2 h of FMD, green tea v. water: 5.0 (95 % CI 3.0, 7.0) %; $P < 0.001$) and from 5 (sd 2.6) to 9.1 (sd 3.6) % (BAD for 2 h of FMD, black tea v. water: 4.4 (95 % CI 2.3, 6.5) %; $P < 0.001$), respectively. The increase in FMD was not significantly different between the two tea preparations (BAD for 2 h of FMD, green tea v. black tea: 0.66 (95 % CI -0.76, 2.09) %; $P = 0.36$). NMD did not vary between any of the groups. In conclusion, green and black teas are equally effective in improving endothelial function.

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Black tea and lignin as ultraviolet protectants for the beet armyworm nucleopolyhedrovirus 1

- Abstract no: Journal of Entomological Science, vol. 44, no. 1, pp. 50-58, 2009

A major constraint to the use of baculoviruses for biocontrol of insects is their sensitivity to UV degradation. In this study, we evaluated black tea (Lipton®, London, UK) and lignin (Reax 85A™, MeadWestvaco, Charleston, SC) as potential UV protectants for beet armyworm *Spodoptera exigua* (Hübner) (Lepidoptera: Noctuidae) multiple-embedded nucleopolyhedrovirus (SeMNPV). The original activity remaining (OAR%) from SeMNPV upon exposure to various lengths of time (up to 5 h) to a source of UVA and UVB was evaluated in bioassays using beet armyworm third-stage larvae under laboratory conditions. Beet armyworm mortality was measured after larvae fed on artificial diet treated with SeMNPV. Mortality of beet armyworm due to SeMNPV, with no UV protectants added, was reduced to 23, 11.3 and 2.1% upon UV exposure for 15, 30 or 60 min, respectively. To investigate the mechanism of reduction in the efficacy of SeMNPV when exposed to UV was due to the degradation of full-length viral genomic DNA, a modified DNA isolation technique was developed to measure levels of the full length viral genomic DNA of SeMNPV through electrophoresis on an agarose gel. The efficacy of SeMNPV on beet armyworm was lost after 2 h of UV exposure, and the full-length genomic DNA also was degraded to levels that were not visible on agarose gel. However, both black tea and lignin provided nearly 100% UV protection for SeMNPV as measured in bioassays even after 5 h of UV irradiation. SeMNPV efficacy against beet armyworm in samples containing black tea or lignin resulted in no significant visual reduction of the full length viral genomic DNA. To investigate the mechanism of UV protection for SeMNPV from black tea and lignin, absorption spectra of both protectants were measured with a spectrophotometer. High rate of absorption in the UV range, especially at the range of UVB (280-320nm), was detected for both materials. The absorption rate was higher with lignin than with black tea. Whereas lignin was a good absorber for both UVB and UVA radiation, black tea was primarily an absorber of UVB. Therefore, both black tea and lignin are potential natural UV protectants in the formulation of baculovirus-based biopesticides.

Blood Glucose Level Lowering Activity of Sri Lankan Black Tea brew (Camellia sinensis) in rats

- Abstract no: PHARMACOGNOSY MAGAZINE, vol.4, no. 16, pp.341-349, 2008

This study examined the blood glucose level lowering ability of black tea brew (BTB) of Sri Lankan *Camellia sinensis* (L.) O. Kuntze (Family: Theaceae). This was tested in normoglycaemic and streptozotocin induced diabetic rats using high grown Dust grade No: 1 tea (doses used: 84 mg/ml, equivalent to 1.5 cups; 168 mg/ml, equivalent to 3 cups; and 501 mg/ml, equivalent to 9 cups, orally). The RESULTS: show that BTB possess promising and significant ($P < 0.05$) hypoglycaemic (both in normoglycaemic fasted rats and non fasted rats), antihyperglycaemic (in terms of improved glucose tolerance test), and antidiabetic (when tested in streptozotocin induced diabetic rats) activities. BTB (only highest dose tested) also exhibited alpha-glucosidase inhibitory activity (in terms of sucrose tolerance test) inhibited glucose absorption from the lumen of small intestine and possessed marked antioxidant activity in vitro (in terms of DPPH assay). On the other hand, the highest dose failed to increase insulin output and glycogen content in liver and skeletal muscle. It is concluded that BTB made from Sri Lankan black tea has blood glucose lowering activity in both normoglycaemic and diabetic status.

Gastric ulcer healing activity of Sri Lankan black tea (Camellia sinensis L.) in rats

- Abstract no: PHARMACOGNOSY MAGAZINE, vol.5, no. 19, pp.260-265, 2009

This study examined the gastric ulcer healing potential of black tea (*Camellia sinensis*) using Sri Lankan high grown Dust grade No: 1 black tea in rat acetic acid-induced gastric ulcer model. Three oral doses (84, 167 or 501 mg/ml) of black tea brew (BTB) made according to ISO recommendations were used in the evaluation of gastric ulcer healing activity. The RESULTS: showed a significant ($P < 0.05$) and dose-dependent gastric ulcer healing activity (in terms of reduction in gastric ulcer area). This effect had a rapid onset (within 14 days). The gastric ulcer healing activity of BTB was however inferior (by 9 fold) to omeprazole, the reference drug. BTB displayed in vitro antioxidant activity (using DPPH assay; by 2985-3923 Trolox equivalents $\mu\text{g/l}$), and also inhibited in vitro nitric oxide production (3-78 %). In addition, BTB had antihistamine activity (by wheal test; by 33.5%) and increased the gastric pH (from 3.3 to 5.9) and impaired the gastric acid output (by 69%). It is concluded that black tea possessed strong, oral gastric ulcer healing activity which is mediated via multiple mechanisms.

TEA HEALTH & WELLNESS TIPS

Protective Action of Aqueous Black Tea (*Camellia sinensis*) Extract (BTE) against Ovariectomy-induced Oxidative Stress of Mononuclear Cells and its Associated Progression of Bone Loss

- Abstract no: PHYTOTHERAPY RESEARCH, vol.23, no.9, pp. 1287-1294, 2009

The protective action of aqueous black tea extract (BTE) against ovariectomy-induced oxidative stress of mononuclear cells and its associated progression of bone loss was demonstrated in this study. Eighteen female adult 6-month-old Wistar albino rats were divided into three groups: sham-control (A), bilaterally ovariectomized (B) and bilaterally ovariectomized + BTE supplemented (C). Studies included the measurement of oxidative (nitric oxide, lipid peroxidation) and antioxidative (superoxide dismutase, catalase) markers, inflammatory cytokines (IL-6, TNF-alpha), osteoclast differentiation factor (RANKL) and bone resorption markers (tartrate-resistant acid phosphatase and hydroxyproline). Also quantitative histomorphometry and histological studies were undertaken. The bone breaking force was measured. The results indicate that BTE was effective in preserving and restoring skeletal health by reducing the number of active osteoclasts. Such changes with BTE supplementation were steadily linked with the reduced oxidative stress of mononuclear cells, serum levels of bone resorbing cytokines, osteoclast differentiation factor and resorption markers. The results of the bone breaking force, histological and histomorphometric analyses further supported the hypothesis. This study suggests that BTE has both protective and restorative actions against ovariectomy-induced mononuclear cell oxidative stress and associated bone loss

Regulation of cell growth through cell cycle arrest and apoptosis in HPV 16 positive human cervical cancer cells by tea polyphenols

- Abstract no: INVESTIGATIONAL NEW DRUGS, vol.28, no.3, pp.216-224, 2010

Cervical cancer is the second most common malignant neoplasm in women, in terms of both incidence and mortality rates worldwide. The polyphenolic constituents of tea (*Camellia sinensis*) have gained considerable attention because of its anti-cancer properties against a variety of cancers. Here we studied the effects of green and black tea polyphenols (GTP and BTP), on cellular proliferation and cell death in the SiHa cells (human cervical cancer) expressing the human papilloma virus (HPV)-16. The result showed that both GTP and BTP inhibited proliferation of cells in dose and time dependent manner. Cell cycle analysis showed anti-proliferative effect of GTP which is associated with an increase in the G2/M phase and apoptotic effect of BTP in 24 h treated SiHa cells. Further, an increase of incubation time for 48 h, GTP caused induction of apoptosis up to 20% of SiHa cells. The role GTP and BTP in apoptosis was further confirmed by reduction in mitochondrial membrane potential and increased levels of membrane phosphatidylserine. Thus, our data suggests that tea polyphenols exhibit anti-cancer potential against cervical cancer by inhibition of cell growth and induction of apoptosis.

Anti-inflammatory activity of Indian black tea (Sikkim variety)

- Abstract No: PHARMACOLOGICAL RESEARCH, vol.51, no.2, pp. 169-175, 2005

In this study, the anti-inflammatory (in reference to the cardinal signs of inflammation) and other related pharmacological activities of the hot water extract of black tea (*Camellia sinensis*, Sikkim variety) were evaluated along with certain standard drugs. The extract showed significant inhibitory activity against carrageenin, histamine, serotonin and prostaglandin-induced pedal inflammation. The extract inhibited exudative inflammation. The tea extract also inhibited cotton pellet-induced granuloma formation and adjuvant-induced polyarthritis. Black tea extract showed significant inhibition against glucose oxidase-mediated inflammation. The present observations establish the efficacy of this particular variety of black tea, both in the exudative and proliferative forms and as well in the chronic phase of inflammation.

TEA HEALTH & WELLNESS TIPS

Green and black tea extracts inhibit HMG-CoA reductase and activate AMP kinase to decrease cholesterol synthesis in hepatoma cells

- Abstract no: Journal of Nutritional Biochemistry, vol. 20, no. 10, pp. 816-822, 2009

Recent studies have demonstrated that green and black tea consumption can lower serum cholesterol in animals and in man, and suppression of hepatic cholesterol synthesis is suggested to contribute to this effect. To evaluate this hypothesis, we measured cholesterol synthesis in cultured rat hepatoma cells in the presence of green and black tea extracts and selected components. Green and black tea decreased cholesterol synthesis by up to 55% and 78%, respectively, as measured by a 3-h incorporation of radiolabeled acetate. Inhibition was much less evident when radiolabeled mevalonate was used, suggesting that the inhibition was mediated largely at or above the level of HMG-CoA reductase. Both extracts directly inhibited HMG-CoA reductase when added to microsomal preparations, although the extent of inhibition was considerably less than the decrease in cholesterol synthesis observed in whole cells. As HMG-CoA reductase activity also can be decreased by enzyme phosphorylation by AMP kinase, the phosphorylation state of HMG-CoA reductase and AMP kinase, which is activated by phosphorylation, was determined in lysates from cells treated with tea extracts. Both extracts increased AMP-kinase phosphorylation and HMG-CoA reductase phosphorylation by 2.5- to 4-fold, but with different time courses: maximal phosphorylation with green tea was evident within 30 min of treatment, whereas with black tea phosphorylation was slower to develop, with maximal phosphorylation occurring ≥ 3 hours after treatment. These results suggest that both green and black tea decrease cholesterol synthesis in whole cells by directly inhibiting HMG-CoA reductase and by promoting its inactivation by AMP kinase. © 2009 Elsevier Inc. All rights reserved.

Addition of whole, semi skimmed, and skimmed bovine milk reduces the total antioxidant capacity of black tea

- Abstract no: Nutrition Research 30 (2010) 14–20

Epidemiological studies have shown that populations consuming fruits, vegetables, tea, cocoa, and red wine have lower incidences of cardiovascular disease, certain cancers, and eye disease. These health effects have largely been attributed to the polyphenol content of the foods and drinks studied. Black tea is rich in a range of polyphenolic compounds that could potentially have health-promoting properties. The scale of consumption of tea in the United Kingdom means that it could be an appropriate vehicle for increasing the antioxidant activity and polyphenol content of human plasma. However, it is common practice in the United Kingdom to add milk to tea, and some studies have suggested that this may decrease the overall antioxidant capacity. The objective of the present study was to analyze and compare the antioxidant capacity of 5 brands of tea and to test the hypothesis that the addition of different volumes of whole milk, semi skimmed, and skimmed milk may affect the antioxidant capacity. Each of the teas analyzed was a significant source of antioxidants. The addition of 10, 15, and 20 mL of whole, semi skimmed, and skimmed bovine milk to a 200-mL tea infusion decreased the total antioxidant capacity of all the brands of tea. Skimmed milk decreased the total antioxidant capacity of the tea infusion significantly ($P < .05$) more than either whole milk or semi skimmed milk. We conclude that black tea is a valuable source of antioxidants and that the effect of milk on the total antioxidant capacity may be related to the fat content of the milk.

Effects of Infusion Time and Addition of Milk on Content and Absorption of Polyphenols from Black Tea

- Abstract no: Journal of Agricultural and Food Chemistry 2007 May 10

Epidemiological studies assessing the health benefits of drinking black tea are equivocal. Such disparity may reflect an inability of semi quantitative assessment to consider how infusion time and addition of milk affect the bioavailability of potentially beneficial antioxidant polyphenols. Six brands of tea demonstrated similar increases in antioxidant capacity and total phenolic and catechin contents with increasing infusion time. These results were unaffected by the addition of milk. Consumption of black tea (400ml) was associated with significant increases in plasma antioxidant capacity (10%) and concentrations of total phenols (20%), catechins (32%), and the flavonoids quercetin (39%) and kaempferol (45%) within 80 minutes. This was unaffected by adding milk. Infusion time may therefore be a more important determinant in the absorption of polyphenols from black tea. Observational studies assessing the health benefits of tea consumption require recording of brewing METHODS: as well as frequency of consumption.

TEA HEALTH & WELLNESS TIPS

Effects of green tea, black tea and Rooibos tea on angiotensin-converting enzyme and nitric oxide in healthy volunteers

- Abstract no: Public Health Nutrition (2010), 13:730-737 Cambridge University Press

Tea has been reported to reduce cardiovascular mortality, but the underlying mechanisms are largely unknown. The aim of the current project was to investigate the effect of green tea (Japanese Sencha), black tea (Indian Assam B.O.P.) and Rooibos tea (South Africa) on angiotensin-converting enzyme (ACE) and nitric oxide (NO). Design Seventeen healthy volunteers received a single oral dose of 400 ml green tea, black tea or Rooibos tea in a randomized, three-phase, crossover study. ACE activity and NO concentration were measured (at 0, 30, 60 and 180 min) in all phases. ACE activity was analysed by means of a commercial radio enzymatic assay. Nitrite was analysed as a marker of NO concentration. In addition, ACE genotype was determined using a PCR method. RESULTS: Oral intake of a single dose of Rooibos tea significantly inhibited ACE activity after 30 min ($P < 0.01$) and after 60 min ($P < 0.05$). A significant inhibition of ACE activity was seen with green tea for the ACE II genotype 30 min after intake of the tea ($P < 0.05$) and for the ACE ID genotype 60 min after intake ($P < 0.05$). A significant inhibition of ACE activity was also seen with Rooibos tea for the ACE II genotype 60 min after intake ($P < 0.05$). No significant effect on ANY concentration was seen. CONCLUSION: These results suggest that green tea and Rooibos tea may have cardiovascular effects through inhibition of ACE activity.

Green and Black Teas Inhibit Atherosclerosis by Lipid, Antioxidant, and Fibrinolytic Mechanisms

-Abstract no: Journal of Agricultural and Food Chemistry, 2004 May 4

Tea is the mostly widely consumed beverage in the world, second only to water. Most laypersons and scientists believe that green tea is healthier than black tea due to the low incidence of heart disease and cancer in the Orient. Here, we report the first dose-response comparison of a green and black tea on normal hamsters after long-term supplementation and on a hamster model of atherosclerosis. Both teas were equally effective in inhibiting atherosclerosis with the lower dose decreasing it 26-46% and the high dose decreasing it 48-63%. Atherosclerosis was inhibited by three mechanisms: hypolipemic, antioxidant, and antifibrinolytic. There was a significant correlation between atherosclerosis and the three mechanisms. In the normal animals, teas also caused some improvement in plasma low density lipoprotein (LDL), LDL/high density lipoprotein ratio, triglycerides, lipid peroxides, lower density lipid peroxides, and fibrinogen. Isolated lower density lipoprotein oxidizability was also reduced in all groups. Green and black teas were equally effective at human equivalent doses, thus confirming human intervention and epidemiology studies and providing mechanisms for tea's benefit.

Coffee, Black Tea and Risk of Gastric Cancer

- Abstract no: Wolters Kluwer Health 2009 October

The aim was to provide information about the association of coffee, black tea with gastric cancer. Between 1985 and 2007, we conducted two case control studies in northern Italy. Overall, cases were 999 subjects with incident, histologically confirmed gastric cancer and controls were 2628 patients admitted to the same network of hospitals for acute non-neoplastic diseases. Odds ratios and the corresponding 95% confidence intervals for coffee (mostly espresso and mocha) and black tea consumption were estimated after allowance for socio-demographic data, smoking and other major covariates of interest. When compared with non-coffee drinkers, the OR was 0.94 for drinkers of one cup of coffee per day, 1.03 for two, 1.07 to three, and 1.24 for four or more cups per day. When compared with non-black tea drinkers, the OR was 0.80 for drinkers of two or more cups of black tea per day. Our investigation, based on a uniquely large dataset, provides convincing evidence that coffee and black tea consumption is unlikely to be strongly associated with gastric cancer risk.

TEA HEALTH & WELLNESS TIPS

Tea Theanine Link to Attention and Focus

The results of human trials presented by John Foxe, Ph.D., Professor of Neuroscience, Biology and Psychology at City College of the City University of New York, explored the effect of theanine, an amino acid present almost exclusively in the tea plant, on alpha brain-wave activity.

Alpha brain rhythm is known to induce a calmer, yet more alert, state of mind. Dr. Foxe and his team used electrophysiological measures to monitor brain activity after individuals drank solutions containing either 250 mg theanine or placebo. "Our results showed that after having theanine, individuals showed significant improvements in tests for attention and that activity in cortical regions responsible for attention functions was enhanced," said Dr. Foxe. New research in Dr. Foxe's laboratory, the Cognitive Neurophysiology Laboratory at the Nathan S. Kline Institute for Psychiatric Research in Orangeburg, NY, suggests that the effects of theanine in combination with caffeine are even greater than with either one alone in improving attention. Theanine may work synergistically with caffeine to help induce a more calming, relaxed state, but one that allows the mind to focus and concentrate better at tasks. A cup of tea contains an average of 20-25 mg of theanine. "We have seen that just 20 minutes after consuming theanine, the blood concentrations increase and the brain's alpha waves are impacted. It lasts about three to four hours, which we have speculated may be why people tend to drink a cup of tea every three-to-four hours during the day," added Dr. Foxe.

The preceding research was presented at the Fourth International Scientific Symposium on Tea and Human Health (2007) held at the United States Department of Agriculture (USDA). (Sponsored by the American Cancer Society, American College of Nutrition, American Medical Women's Association, American Society for Nutrition, The Linus Pauling Institute and the Tea Council of the U.S.A., was held at the United States Department of Agriculture (USDA))

Antifungal Activity of Black Tea Polyphenols (Catechins and Theaflavins) against Candida Species

- Abstract No: CHEMOTHERAPY, vol.55, no.3, pp. 189-196, 2009

BACKGROUND:/Aims: The polyphenols catechins and theaflavins in black tea have been shown to possess many medicinal properties, including anticancer activity and some antifungal characteristics, but there have been few studies of their anti-Candida activity. In this paper we report the **RESULTS:** of our study of the anti-Candida activity of tea polyphenols. **METHODS:** The effects of 4 different concentrations of catechins and theaflavins were evaluated on 5 isolates each of 5 Candida species employing an agar diffusion growth inhibition assay. The minimum inhibitory concentration (MIC) of the polyphenols against *C. albicans* was determined. The post-antifungal effect (PAFE) of the polyphenols for *C. albicans* was investigated. *C. albicans* cells exposed to polyphenols were studied using a scanning electron microscope (SEM). **RESULTS:** Both polyphenols showed anti-Candida activity against all tested Candida species and demonstrated a MIC of 6.25 mg/ml for *C. albicans*. *C. glabrata* was found to be the most sensitive species followed by *C. parapsilosis*, *C. albicans*, *C. krusei* and *C. tropicalis* ($p < 0.05$ for all). Significant intraspecies variations in sensitivity were noted among *C. parapsilosis* and *C. tropicalis* ($p < 0.001$) for both polyphenols. Theaflavins displayed standard PAFE while catechins showed a paradoxical PAFE with all isolates of *C. albicans*. SEM revealed considerable cell wall damage of *C. albicans* cells exposed to the polyphenols. **CONCLUSION:** The study reveals for the first time the anti-Candida properties of black tea polyphenols that may find therapeutic applications in future.

Black tea could lower risk of Parkinson's disease

(Published by the Tea Advisory Panel)

Drinking black tea regularly could reduce the risk of developing Parkinson's disease, concluded a study¹. Commenting on the study, Dr Ann Walker, a member of The Tea Advisory Panel (TAP) notes: "This was a large, prospective study, involving 63,257 Chinese men and women, aged 45 to 74, living in Singapore. Those who drank more than 23 cups of black tea each month were 71 per cent less likely to contract the disease. As a result, this latest research study is great news for all UK „black tea“ drinkers. In the past there seems to have been more of a focus by scientists reviewing the health benefits of green tea." "In the UK, one in 500 people, i.e., around 120,000 individuals have Parkinson's. About 10,000 people in the UK are diagnosed each year²." Three case-control studies in the US³, Hong Kong⁴ and Singapore⁵ and a cohort study of male health professionals in the US⁶ have reported an inverse association between tea drinking and Parkinson's disease risk, but differences in benefit between black tea and green tea were not investigated in these studies." Dr Walker continues: "The authors of these previous four studies attributed the protective effect of tea, at least in part, to its caffeine content. In the current study, however, the beneficial effect of black tea did not appear to be influenced by caffeine intake, indicating that ingredients other than caffeine are responsible for black tea's protective effects. "A key

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difference between black tea and green tea lies in the types and amounts of flavonoids. Green teas contain more of the simple flavonoids called catechins. But when black tea is made, the catechins undergo oxidation resulting in the generation of more complex varieties, called thearubigins and theaflavins." In CONCLUSION: Dr Walker notes: "The underlying mechanisms for this protective effect of black tea on Parkinson's disease remains unclear until further research is done. But drinking even one cup of black tea per day could help to reduce the risk of Parkinson's disease."

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Black Tea May Fight Diabetes

- Abstract No: Science Daily (Aug. 13, 2009)

Long known for its antioxidants, immune boosting and, most recently, antihypertensive properties, black tea could have another health benefit. Black tea may be used to control diabetes, according to a study in the *Journal of Food Science*, published by the Institute of Food Technologists. Next to water, tea is the second most consumed beverage in the world. Researchers from the Tianjin Key Laboratory in China studied the polysaccharide levels of green, oolong and black teas and whether they could be used to treat diabetes. Polysaccharides, a type of carbohydrate that includes starch and cellulose, may benefit people with diabetes because they help retard absorption of glucose. The researchers found that of the three teas, the polysaccharides in black tea had the most glucose-inhibiting properties. The black tea polysaccharides also showed the highest scavenging effect on free radicals, which are involved in the onset of diseases such as cancer and rheumatoid arthritis.

Glucose-lowering effect of powder formulation of African black tea extract in KK-A(y)/TaJcl diabetic mouse.

- Abstract No: Archives of pharmacal research, 2006 Sep, 29(9):786-794

We observed the suppressive effect of a powder formulation of African black tea extract prepared from the leaves of *Camellia sinensis* on type 2 non-insulin dependent diabetic mice, KK-A(y)/TaJcl. Black tea extract significantly showed suppressive effect of the elevation of blood glucose on oral glucose tolerance test of 8 week-old KK-A(y)/TaJcl mice ($P < 0.05$). Long-term treatment with black tea extract showed significant suppression of post-prandial blood glucose and obesity ($P < 0.05$). The weight of the intestine of mice treated with black tea extract was significantly reduced ($P < 0.05$). From these results African black tea used in this study showed a suppressive effect on the elevation of blood glucose during food intake and the body weight.

Black tea polyphenols-mediated in vivo cellular responses during carcinogenesis.

- Abstract No: Mini reviews in medicinal chemistry, June 01, 2010, 10(6):492-505

Tea (*Camellia sinensis*), a popular beverage, is consumed worldwide. The biological activities and mechanism(s) of chemopreventive effects of green tea polyphenols (monomeric catechins) have been extensively studied, while similar information regarding newly formed major black tea polyphenols (BTPs-oligomeric, polymeric) is not available. Therefore, this review focuses mainly on compiling the evidence on chemopreventive efficacy of black tea extract (BTE) / BTPs and describing their mechanism(s) of anti-initiating, anti-promoting and anti-progressor action(s) in in vivo experimental systems. Overall, the mechanism(s) implicated in the BTPs-mediated inhibition are diverse and involve effects on multiple molecular pathways and genes.

TEA HEALTH & WELLNESS TIPS

Synergistic effects of tea polyphenols and ascorbic acid on human lung adenocarcinoma SPC-A-1 cells

- Abstract no: JOURNAL OF ZHEJIANG UNIVERSITY-SCIENCE B, vol. 11, no. 6, pp. 458-464, 2010

Tea polyphenols have been shown to have anticancer activity in many studies. In the present study, we investigated effects of theaflavin-3-3'-digallate (TF3), one of the major theaflavin monomers in black tea, in combination with ascorbic acid (AA), a reducing agent, and (-)-epigallocatechin-3-gallate (EGCG), the main polyphenol presented in green tea, in combination with AA on cellular viability and cell cycles of the human lung adenocarcinoma SPC-A-1 cells. The 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay showed that the 50% inhibition concentrations (IC50) of TF3, EGCG, and AA on SPC-A-1 cells were 4.78, 4.90, and 30.62 $\mu\text{mol/L}$, respectively. The inhibitory rates of TF3 combined with AA (TF3+AA) and EGCG combined with AA (EGCG+AA) at a molar ratio of 1:6 on SPC-A-1 cells were 54.4% and 45.5%, respectively. Flow cytometry analysis showed that TF3+AA and EGCG+AA obviously increased the cell population in the G(0)/G(1) phase of the SPC-A-1 cell cycle from 53.9% to 62.8% and 60.0%, respectively. TF3-treated cells exhibited 65.3% of the G(0)/G(1) phase at the concentration of its IC50. Therefore, TF3+AA and EGCG+AA had synergistic inhibition effects on the proliferation of SPC-A-1 cells, and significantly held SPC-A-1 cells in G(0)/G(1) phase. The RESULTS: suggest that the combination of TF3 with AA or EGCG with AA enhances their anticancer activity.

Black tea – helpful or harmful? A review of the evidence

- Abstract no: European Journal of Clinical Nutrition (2007) 61, 3–18. doi:10.1038/sj.ejcn.1602489

OBJECTIVE: To consider whether consumption of black tea has a positive or negative impact on health.
Design: Databases were searched for relevant epidemiological and clinical studies published between 1990 and 2004.
RESULTS: Clear evidence was found for coronary heart disease (CHD), where an intake of 3 cups per day related to risk reduction. The mechanism could involve the antioxidant action of tea polyphenols. While experimental models have suggested that flavonoids attenuated cancer risk, epidemiological studies failed to demonstrate a clear effect for tea, although there is moderate evidence for a slightly positive or no effect of black tea consumption on colorectal cancer. Studies on cancer were limited by sample sizes and insufficient control of confounders. There is moderate evidence suggestive of a positive effect of black tea consumption on bone mineral density although studies were few. There is little evidence to support the effect of tea on dental plaque inhibition but evidence to support the contribution of tea to fluoride intakes and thus theoretical protection against caries. There was no credible evidence that black tea (in amounts typically consumed) was harmful. Normal hydration was consistent with tea consumption when the caffeine content was <250 mg per cup. A moderate caffeine intake from tea appeared to improve mental performance, although sample sizes were small. There was no evidence that iron status could be harmed by tea drinking unless populations were already at risk from anaemia. **CONCLUSION:** There was sufficient evidence to show risk reduction for CHD at intakes of 3 cups per day and for improved antioxidant status at intakes of one to six cups per day. A maximum intake of eight cups per day would minimise any risk relating to excess caffeine consumption. Black tea generally had a positive effect on health.

The health effect of black tea and flavonoids

- Abstract no: Nutrition and Food Science 2009

Black tea was strongly associated with heart disease prevention by plausible mechanisms linked to flavonoid bioactivity. In vitro studies suggest that tea has anti-cancer properties but this needs to be confirmed by addition long-term human studies. Emerging research indicates that tea may benefit cognitive function and weight management, although more studies are needed. Tea flavonoids are bioavailable with or without milk. The benefits of tea drinking are of relevance to public health as tea is the main contributor to dietary flavonoids in Western countries. Consuming one to eight cups of black tea per day is associated with a reduced risk of chronic diseases. Caffeine intakes at this level are moderate.

TEA HEALTH & WELLNESS TIPS

The effects of tea on psycho physiological stress responsivity and post-stress recovery: a randomized double-blind trial

- Abstract no: Psychopharmacology 2006 September 30.

Tea has anecdotally been associated with stress relief, but this has seldom been tested scientifically. To investigate the effects of 6 weeks of black tea consumption, compared with the matched placebo, on subjective, cardiovascular, cortisol and platelet responses to acute stress, in a parallel group double-blind randomized design. Seventy-five health non-smoking men were withdrawn from tea, coffee and caffeinated beverages for a 4 week wash out phase during which they drank four cups per day of a caffeinated placebo. A pre-treatment laboratory test session was carried out, followed by either placebo or active tea treatment for 6 weeks, then, a final test session. Cardiovascular measures were obtained before, during and after the two challenging behavioural tasks which cortisol, platelet and subjective measures were assessed before and after the tasks. The tasks induced substantial increases in blood-pressure, heart rate and subjective stress ratings, but responses did not differ between tea and placebo treatments. Platelet activation was lower following tea than placebo treatment in both baseline and post-stress samples. The active tea group also showed lower post-task cortisol levels compared with placebo, and a relative increase in subjective relaxation during the post-task recovery period. Compared with placebo, 6 weeks of tea consumption leads to lower post-stress cortisol and greater subjective relaxation, together with reduced platelet activation. Black tea may have health benefits in part by aiding stress recovery.

Black tea consumption dose-dependently improves flow-mediated dilation in healthy males

- Abstract no: Journal of Hypertension 2009 April

flavonoids may prevent against cardiovascular disease. Tea is a major source of dietary flavonoids. Studies indicate black tea improves endothelial function but data on arterial haemodynamics, blood pressure and insulin resistance are equivocal. According to a randomized, double-blind, controlled, cross-over design, 19 healthy men were assigned to receive either five treatments with a twice daily intake of black tea in five period lasting one week each. Our study is the first showing black tea ingestion dose dependently improved FMD (flow-mediated dilation) and decreased peripheral arterial stiffness in healthy volunteers. Our data suggests that worldwide all tea drinkers could benefit from protective cardiovascular effects exerted by tea.

The in vitro effects of Rooibos and Black tea on immune pathways

- Abstract no: Journal of immunoassay & immunochemistry, 2010 Apr, 31(2):169-180

The in vitro effects of Aspalathus linearis (Rooibos tea) and Camellia sinensis (Black tea) on biomarkers of specific immune pathways were determined using whole blood culture assays. Stimulated and unstimulated whole blood cultures were incubated with tea extracts. Enzyme linked immunosorbent assays were used to screen spent culture medium for Interleukin-6, Interleukin-10 and Interferon gamma as biomarkers for inflammation, humoral immunity, and cell mediated immunity, respectively. Rooibos and Black tea addition to unstimulated whole blood cultures induced higher Interleukin-6, Interleukin-10, and Interferon gamma secretion. Addition of Rooibos tea to stimulated whole blood cultures induced higher Interleukin-6, lower Interleukin-10, and had no effect on Interferon gamma secretion. Black tea addition to stimulated whole blood cultures inhibited Interleukin-6, Interleukin-10, and Interferon gamma production. The data indicates that Rooibos and Black tea modulates immune function in vitro.

TEA HEALTH & WELLNESS TIPS

Modulatory effects of black v. green tea aqueous extract on hyperglycaemia, hyperlipidaemia and liver dysfunction in diabetic and obese rat models

- Abstract no: *British Journal of Nutrition* (2009), 102, 1611–1619

Cardiovascular complications are a major cause of morbidity and mortality in patients with diabetes, obesity and the metabolic syndrome. Recently, there has been an increasing interest in tea as a protective agent against CVD. Here, we compared the modulatory effects of two different doses (50 and 100 mg/kg body weight given orally for 28 consecutive days) of black tea aqueous extract (BTE, rich in theaflavins and thearubigins) and green tea aqueous extract (GTE, rich in catechins) on experimentally induced hyperglycaemia, hyperlipidaemia and liver dysfunction by alloxan (which destroys pancreatic b-cells and induces type 1 diabetes) and a cholesterol-rich diet (which induces obesity and type 2 diabetes) in male Wistar albino rats. Both tea extracts significantly alleviated most signs of the metabolic syndrome including hyperglycaemia (resulting from type 1 and 2 diabetes), dyslipidaemia and impairment of liver functions induced by alloxan or the cholesterol-rich diet in the animals.

Also, the tea extracts significantly modulated both the severe decrease and increase in body weight induced by alloxan and the high-cholesterol diet, respectively. The modulatory effects obtained here were partial or complete, but significant and dose dependent, and slightly more in GTE in most cases. No harmful effects were detected for tea consumption on all parameters measured, except that the high dose of both tea extracts significantly decreased the spleen weight: body weight ratio and induced lymphopenia. The present study supports the hypothesis that both black and green teas may have beneficial effects against the risks of the metabolic syndrome and CVD as shown in rat models of human obesity and diabetes.

Aqueous extract of black tea (*Camellia sinensis*) prevents ethanol plus cholecystokinin-induced pancreatitis in a rat model

- Abstract No: *LIFE SCIENCES*, vol. 78, no. 19, pp. 2194-2203, 2006

Black Tea Extract (BTE), a phytochemical has been attributed with a plethora of health-promoting actions. We have previously demonstrated that BTE inhibits chronic hepatitis in a rat model induced with high-fat and ethanol (EtOH). This study reports that BTE prevents altered pancreatic acinar cell functions, oxidative stress, inflammatory changes and DNA damage in the EtOH+cholecystokinin (CCK)-induced model of pancreatitis. The EtOH+CCK model rats were administered with BTE, and were examined the activity of pancreatic digestive enzymes (amylase and lipase), proinflammatory cytokines (IL-6 and TNF-alpha), oxidative and antioxidative enzymes (nitric oxide, NO; malondialdehyde, MDA; superoxide dismutase, SOD; catalase, CAT), antioxidant level (glutathione, GSH), histopathological changes and the integrity of genomic DNA. Results show that because of chronic EtOH treatment, serum level of amylase and lipase (two biomarkers for pancreatitis) and pancreatic levels of MDA and NO (two biomarkers of oxidative stress) increased significantly, which could be effectively blunted by BTE. BTE could normalize EtOH+CCK-induced suppressed activities of SOD and CAT, and GSH content of pancreatic tissue. Also, histopathological and inflammatory changes during EtOH+CCK-induced pancreatitis could be blunted by BTE. Furthermore, BTE could effectively reduce EtOH+CCK-induced increase in DNA fragmentation and damage. These findings suggest that BTE prevents pancreatitis caused by chronic EtOH+CCK toxicity presumably by enhancing antioxidant, anti-inflammatory and antiapoptotic activity in rats.

The In Vitro Effects of Rooibos and Black Tea on Immune Pathways

- Abstract no: *Journal of Immunoassay and Immunochem* 2010 April 31

The in vitro effects of *Aspalathus linearis* (Rooibos tea) and *Camellia sinensis* (Black tea) on biomarkers of specific immune pathways were determined using whole blood culture assays. Stimulated and unstimulated whole blood cultures were incubated with tea extracts. Enzyme linked immunosorbent assays was used to screen spent culture medium for Interleukin-6, Interleukin 10, and Interferon gamma as biomarkers for inflammation, humoral immunity, and cell mediated immunity, respectively. Rooibos and black tea addition to unstimulated whole blood cultures induced higher Interleukin-6, Interleukin 10, and Interferon gamma secretion. Addition of rooibos tea to stimulated whole blood cultures induced higher Interleukin-6, Interleukin 10, and had no effect on Interferon gamma secretion. Black tea addition to stimulated whole blood cultures inhibited Interleukin-6, Interleukin-10, and Interferon gamma production. The data indicates that rooibos and black tea modulates immune function in vitro.

TEA HEALTH & WELLNESS TIPS

Acute effects of ingestion of black tea on postprandial platelet aggregation in human subjects

- Abstract no: British Journal of Nutrition (2002), 87:141-145 Cambridge University Press

Results of population studies suggest that black tea can reduce cardiovascular risk. Effects of black-tea polyphenols to reduce platelet aggregability may help to explain any benefits. Given that black tea is often consumed with and after meals, and man spends much of his life in the postprandial state, the objective of the present study was to investigate the acute effects of ingestion of black tea on postprandial platelet aggregation ex vivo. Twenty healthy participants had platelet aggregation and blood lipids assessed before and 4 h after the ingestion of 50 g dairy fat on two occasions in random order, corresponding to black tea or hot water. Black tea or hot water (one cup) was consumed immediately following the dairy fat, then after 1.5 and 3.0 h. Platelet aggregation ex vivo was assessed in platelet-rich plasma in response to three concentrations of collagen (0.2, 0.6, 2.0 µg/ml) and ADP (2, 4, 8 µM). Urinary concentrations of 4-O-methylgallic acid were used as an indicator that tea polyphenols were absorbed. Serum total cholesterol and triacylglycerol concentrations increased significantly 4 h after ingesting the dairy fat, but there was no significant difference between black tea and hot-water treatments on the cholesterol or triacylglycerol responses. Urinary 4-O-methylgallic acid concentrations were significantly increased following ingestion of black tea ($P=0.0001$) but not water. Black tea in comparison to hot water did not inhibit collagen or ADP-induced postprandial platelet aggregation. The results of this study do not support the suggestion that reduced postprandial platelet aggregability contributes to any benefits of black tea on cardiovascular risk.

Effects of black and green tea consumption on blood glucose levels in non-obese elderly men and women from Mediterranean Islands (MEDIS epidemiological study)

- Abstract no: Eur J Nutr. 2008 Feb;47(1):10-6.

Obesity and diabetes are metabolic disorders that affect a large amount of the elderly population and are related to increased cardiovascular risk. **BACKGROUND:** Obesity and diabetes are metabolic disorders that affect a large amount of the elderly population and are related to increased cardiovascular risk. Tea intake has been associated with lower risk of mortality and morbidity in some, but not all studies. We evaluated the association between tea intake, blood glucose levels, in a sample of elderly adults. **METHODS:** During 2005-2006, 300 men and women from Cyprus, 142 from Mitilini and 100 from Samothraki islands (aged 65-100 years) were enrolled. Dietary habits (including tea consumption) were assessed through a food frequency questionnaire. Among various factors, fasting blood glucose and body mass index (BMI) were measured. **RESULTS:** Fifty-four percent of the participants reported that they consume tea at least once a week (mean intake 1.6 +/- 1.1 cup/day). A significant interaction was observed between tea intake, obesity status on glucose levels ($P < 0.001$). After adjusting for various confounders, tea intake was associated with lower blood glucose levels in non-obese (P for trend <0.001), but not in obese people ($P = 0.24$). Multiple logistic regression analysis revealed that moderate tea consumption (1-2 cups/day) was associated with 88% (95% CI 76-98%) lower odds of having diabetes among non-obese participants, irrespective of age, sex, smoking, physical activity status, dietary habits and other clinical characteristics. **CONCLUSION:** Tea consumption is associated with reduced levels of fasting blood glucose only among non-obese elderly people.

Especially Theaflavin-3-gallate, Reduce the Incorporation of Cholesterol into Mixed Micelles

- Abstract no: J Agric Food Chem. 2008 Dec 2.

Tea is one of the most widely consumed beverages in the world and may be associated with reduced heart disease rates. Theaflavins, which are formed in the production of black tea, has been suggested being responsible for the blood-cholesterol-lowering (BCL) effects of tea. We hypothesized that the effect of theaflavins on BCL could be through interference in the formation of dietary mixed micelles, which could result in reduced intestinal cholesterol absorption. Micelles were produced by mixing oleic acid, bile acids, lyso-phosphatidylcholine, and cholesterol. Theaflavin-treated micelles/particles were analyzed using electron microscopy (cryo-TEM), high-performance liquid chromatography (HPLC) analysis, and light-scattering particle size measurements. A dose-dependent inhibitory effect of theaflavins on the incorporation of (14)C-labeled cholesterol into micelles and a theaflavin-dependent increase in particle size was found. These particles consisted of insoluble large multilamellar vesicles with onion-like structures. Ultracentrifugation and HPLC analysis revealed that the pellets contained mainly theaflavin-3-gallate, while the remaining theaflavins were found to be present in the supernatant. Using purified theaflavin subtypes confirmed that mainly theaflavin-3-gallate is responsible for multilamellar vesicle formation. These results show that theaflavins can play a role in decreased intestinal cholesterol absorption via inhibition of micelle formation.

TEA HEALTH & WELLNESS TIPS

Protective effect of black tea against ethanol-induced oxidative modifications of liver proteins and lipids.

- Abstract No: *Journal of studies on alcohol*, 2006 Jul, 67(4):510-518

OBJECTIVE: Black tea has been recently ascertained as a source of water-soluble antioxidants that may enhance cellular antioxidant abilities. The present study was designed to investigate the efficacy of the preventive effect of black tea on oxidative modifications of liver lipids and proteins of 2-month-old rats intoxicated chronically (28 days) with ethanol. **METHOD:** Lipid peroxidation was estimated by measurement of lipid hydroperoxides, malondialdehyde, and 4-hydroxynonenal by high-performance liquid chromatography (HPLC) and by spectrophotometric determination of conjugated dienes. The markers of protein oxidative modification products-bityrosine and tryptophan-were quantified by spectrofluorimetry, whereas levels of amino, sulfhydryl, and carbonyl groups were estimated spectrophotometrically. **RESULTS:** Ethanol intoxication caused changes in liver antioxidant abilities that led to the generation of oxidative stress and, consequently, to the significant increase in products of lipid and protein oxidative modification. Enhanced lipid peroxidation was confirmed by assessment of the concentration of lipid peroxidation products measured at all examined levels. Protein modifications were evidenced by increase in levels of bityrosine and carbonyl groups and by decrease in concentration of tryptophan and levels of sulfhydryl and amino groups. The metabolic consequences of oxidative modifications of lipids and proteins were reduced by cathepsin B activity and translocation of this lysosomal protease into cytosol as well as markers of liver damage-alanine aminotransferase (ALT) and aspartate aminotransferase (AST)-into the blood serum. Administration of black tea to ethanol-intoxicated rats partially protected antioxidant parameters and, remarkably, prevented the significant increase in concentrations of all measured lipid peroxidation products. Moreover, the levels of markers of the protein-modification process were similar to those of the control group. Protection of biological membranes by black tea prevents changes in the permeability of these membranes and translocation of the examined enzymes. **CONCLUSION:** Our findings indicate that black tea protects proteins and lipids against oxidative modification induced by chronic ethanol intoxication, which preserves changes in redox and proteolytic homeostasis. Theaflavins from Black Tea,

Especially Theaflavin-3-gallate, Reduce the Incorporation of Cholesterol into Mixed Micelles

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TEA HEALTH & WELLNESS TIPS

Black tea polyphenols mimic insulin/insulin-like growth factor-1 signalling to the longevity factor FOXO1a
- Abstract no: Aging Cell. 2008 Jan;7(1):69-77.

In vertebrates and invertebrates, relationships between diet and health are controlled by a conserved signalling pathway responsive to insulin-like ligands. In invertebrate models for example, forkhead transcription factor family O (FOXO) transcription factors in this pathway regulate the rate of aging in response to dietary cues, and in vertebrates, obesity and age-induced deficits in the same pathway are thought to contribute to dysregulation of hepatic gluconeogenesis through genes such as phosphoenolpyruvate carboxykinase (PEPCK). Recently, we have begun to screen for dietary constituents capable of regulating this pathway in our cell culture model. Here, we identify three black tea theaflavins, theaflavin 3-O-gallate, theaflavin 3'-O-gallate, theaflavin 3,3'-di-O-gallate and thearubigins as novel mimics of insulin/IGF-1 action on mammalian FOXO1a, PEPCK and moreover we provide evidence that the effects on this pathway of the green tea constituent (-)-epigallocatechin gallate depend on its ability to be converted into these larger structures. With the exception of water, tea is the most popular drink globally, but despite this, little is known about the biological availability of black tea polyphenols in vivo or the molecular target(s) mediating the effects presented here. Further investigation in these two areas might provide insight into how age-related metabolic disease may be deferred. .

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