Organic Certifications

The Metropolitan Tea Company Ltd.

Ethical Associations Environmental Policies

Food Safety and Product Protection Certifications

LE1307

JAPAN GENMAICHA YAMASAKI

a.k.a. Popcorn Tea

GREEN TEA

PRIMARY NOTES:

Category:	(GR JP): Green Tea. China
Variety:	Steamed green tea with natural components
Grade:	Sencha – made to Japanese specifications
Packing:	Loose Tea: 20 year shelf-life Garden-Fresh MAAVP*
	Tea Bags/Classic: 20 year shelf-life Garden-Fresh MAAVP*
	Tea Bags/Pyramid: 2 year shelf-life†

* Metropolitan Advanced Atmospheric Vacuum Pack

† 2 year shelf life is due to the biodegradability of the tea bag material.

PRODUCT CODES AVAILABLE:

Note: Sizes may change - please go to www.metrotea.com On-Line catalog for the latest information.

Loose Tea

41GR JP 522** 100 g/3.5 oz
Q3GR JP 522** 2 g/0.07 oz
*** Exception: Vacuum nitrogen flush packing – 3 year shelf life*

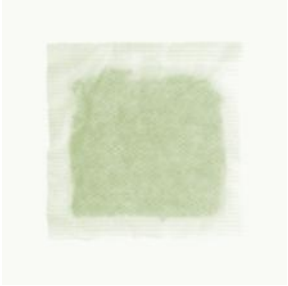
A2GR JP 522 250 gram/0.55 lb
A5GR JP 522 500 gram/1.1 lb
ABGR JP 522 2 kg / 4.4 lb
AYGR JP 522 16 kg / 35.2 lb

L.U.D.I.F.Y.
500 gram/1.1lb
1 kg/2.2 lb
2 kg/4.4 lb
16 kg / 35.2 lb

Tea Bags / Pyramid

TYX5 GR JP 522 50 tea bags
TYC2 GR JP 522 200 tea bags
TYM3 GR JP 522 3000 tea bags

Tea Bags / Classic



T2X6 GR JP 522 60 tea bags
T2C5 GR JP 522 500 tea bags
T2M4 GR JP 522 4000 tea bags

CUPPING NOTES:

Cup Characteristics: Light, golden yellow liquor with a unique, toasty rice flavor tending sweet. A tea that creates conversation.

Infusion: Tending bright with toasted rice kernels.

Pairing Suggestions: Sushi, Fish sashimi, Japanese style noodle soups, Fish or vegetable tempura, Horse sashimi with a raw egg and julienned cucumbers

Food Use Suggestions:

GREEN BEANS WITH GARLIC AND GENMAICHA TEA

1 lbs. fresh green beans, trimmed
2 cloves of garlic, minced
2 tbs. Genmaicha tea leaves, brewed in two cups of spring water
Steam green beans in water. While beans are steaming, saute minced garlic in one tsp. of canola oil until opaque. Add brewed tea and simmer with garlic for a few minutes. Remove beans from steamer and put in a large bowl. Pour tea marinade over drained beans. Garnish with toasted almond slices, as desired. Serve immediately.

OTHER TIPS

1. Try prepared tea in place of water or stock when cooking rice or other grains for a delicate tea flavour.
2. Experiment with different varieties of tea. Preparing Basmati rice with jasmine or Formosa oolong tea, brown rice with a strong breakfast-type tea, and miso soup with green tea - especially Genmaicha Yamasaki, which has a nice toasty flavour thanks to the roasted rice in this type of tea.
3. In general, substitute one half or more of the liquid (water or stock) called for in a recipe with tea. You may need to adjust some seasonings, especially salt.

ORIGIN NOTES:

Small Batch Blended and Packed in Canada at The Metropolitan Tea Company. HACCP Certified.

Ingredients From: China
Region(s): Zhejiang Province
Seasonality: Seasonal quality (Mar.-Apr.growth)
Shipping Port(s): Shanghai
Grade Composition: Sencha
Growing Altitude(s): 500'-1500' feet above sea level
Manufacture Type(s): Steamed Green Tea

MORE ABOUT JAPAN GENMAICHA YAMASAKI TEA:

This is a specialty Japanese style green tea (normally a high grade of Japan Sencha) that is blended with fire-toasted rice. The fresh vegetative character of the green tea is imparted on the cup but it is tempered with the bakey-like character of the rice. There is a natural sweetness and almost chewy character to the finish of this tea. During the firing of the rice, it is not uncommon for rice to 'pop' not unlike popcorn, hence the pet name 'popcorn-tea'

Legend has it that during the 1400's an important samurai warlord in Hakone on the Izu Peninsula of Honshu Island (the Izu Peninsula is near the Shizuoka area) was having tea in the morning discussing a battle strategy with his patrol leaders. A servant by the name of Genamai was serving hot tea to the group. Leaning over to give tea to the warlord, rice that he had surreptitiously taken for a morning snack fell out of his pocket into the steaming hot tea. Some popped upon hitting the hot tea. The warlord was incensed, jumped up brandishing his samurai sword he promptly cut of Genamai's head in one fell swoop. He then sat down to continue the meeting. Despite the fact that the tea had been tarnished he drank it anyway. The flavor was very unique and he enjoyed it tremendously. In honor of poor Genamai he pronounced that this rice and tea be served every morning and be called 'Genmaicha' (cha being the name of 'tea' in Japanese)

FYI: After the Fukushima nuclear accident we shifted the source of this tea to Japanese tea gardens in China. It was and continues to be the correct food safety precaution.

PRODUCT SPECIFICATIONS:

Luxury Ingredients (Loose Tea and Pyramid Tea Bags): Green tea, and Roasted & Popped Rice.
Luxury Ingredients (Tea Bag /Classic): Green tea, and Roasted & Popped Rice.
Food Safety: **HACCP -** Hazard Analysis Critical Control Points
GMP – Good Manufacturing Processes

C-TPAT – Customs Trade Partnership Against Terrorism

Allergens: **Nuts:** No **Gluten:** No **Wheat:** No **Sulfites:** No
Soy Lecithin: No **Crustacea**: No **Eggs:** No **Milk or dairy:** No
• Packed at a factory that has a HACCP certified allergen control program.
• Packed at a factory that has nuts on the premises

Caffeine: **Caffeine content: Low**
This tea contains natural caffeine found in the *L. Camellia Sinensis* family.
A cup of green tea steeped in boiled water for 5 minutes will contain between 22 to 29 mg of caffeine – about 15% less than an equal serving of Coca-Cola **. An equal sized cup of coffee will contain between 80 – 100 mg of caffeine. Caffeine quickly becomes soluble in very hot water. If you wish to reduce the caffeine level in this tea, briefly rinsing the tea leaves in extremely hot water will reduce the caffeine content between 25-50% with only a minor effect on taste.
** *As reported by Health Canada*

Est. Antioxidant Guide: **Antioxidant Content: Low <5%** polyphenols by dry weight.
Note: The longer you steep your tea the more polyphenols will be extracted. (*Test results based on 5 minutes steeping time. Polyphenol percentages may fluctuate with lot, grade of tea, testing method, temperature of water and freshness of tea)*

Food Standards: This tea meets or exceeds the food safety compliance standards covering microbiological activity, heavy metals and pesticide MRL's for the European Union, Japan, Canada, USA and all other major tea importing countries.

Product Assurance: All the ingredients used in this tea are commonly used in teas and other foods.

Radiation Statement: This tea is not irradiated in any form.

GMO Statement: This product is not made with any elements that might be Genetically Modified.

Environment Statement #1: This tea comes from tea estates that undertake responsible land-use practices. Tea estate land not used for tea cultivation or worker vegetable gardens, remains in its natural state or has been reforested as part of the estate's managed-forest program.

Environment Statement #2: Metropolitan Tea Company created its own carbon-offset program by purchasing 200 acres of land. This land contains 80 acres of wetland maintaining a healthy home for more than 50 different species of amphibians, reptiles, fish, songbirds and migrating waterfowl; 80 acres of mature hardwood forest for an immediate carbon-offset and 40 acres of pastureland which was reforested in 2011 with more than 25,000 native trees.

Environment Statement #3: 2012 – Metropolitan Tea Company Ltd. completed a 500 kwh solar array on its factory roof.

Environment Statement #4: January 2013 – Metropolitan Tea Company Ltd. is carbon negative.

NUTRITIONAL INFORMATION:

Canada

per 175 ml - % of Daily Values

Calories	0
Fat 0g	0 %
Sodium 2mg	0 %
Carbohydrate 1g	0 %
Protein	0.1g

Not a significant source of fat, saturated fat, trans fat, cholesterol, dietary fiber, sugars, vitamin A, vitamin C, calcium and iron.

USA

Serving size 1 teabag or 2.5g of loose tea. Makes 8 fl oz or 240ml
Amount per Serving,

Calories:	0 Cal.
Percent of Daily Value	
Fat 0g	0 %
Sodium 2mg	0 %
Carbohydrate 1g	0%
Protein 0.1g	

Not a significant source of fat, saturated fat, trans fat, cholesterol, dietary fiber, sugars, vitamin A, vitamin C, calcium and iron.

UK

*100 ml tea infusion *(no milk) typically gives you:*

Energy	2kJ less than 1kcal
Protein	0.1g
Carbohydrate	trace : of which come from sugars: trace
Fat	trace : of which come saturated fats: trace
Fibre	0g

Sodium trace

Per serving of 200ml (1 cup)

1 Calorie

0g Fat

Per serving of 170ml tea infusion and 30ml semi-skimmed milk

14 Calories

0.5g Fat

** Based on tea brewed with freshly boiled water for 3 minutes.*

PRODUCT CREDENTIALS:

Organic Credentials This tea is a **non-organic conventional** tea packed at The Metropolitan Tea Company. Metropolitan Tea Company Ltd. is a certified organic tea handler; certified by Pro-Cert Systems Limited and equivalency agreements with NOP, COR (Canadian Organic) and EU (European Organic) programs. Metropolitan Tea Company Ltd. Is also certified by the Organic Farmers & Growers of the European Union. Go to www.metrotea.com for the most recent copy of our organic certificate.

Social Credentials: 100% of the tea comes from tea estates certified by:

- Metropolitan Tea global audit program

BREWING RECOMMENDATIONS – 1 cup; 230-280ml, 8-10 fl oz):

Weaker Tea:	¾ teaspoon (1.7 gr. / 0.06 oz.)
Regular Strength Tea:	1 teaspoon (2.2 gr. / 0.08 oz.)
Stronger Tea:	1 ½ teaspoon (3.0 gr. / 0.11 oz.)
Sugg. Brewing Temp:	100'C / 212'F (*against green tea tradition, we recommend boiling temperature to ensure water is sterilized)*
Sugg. Brewing Time:	Weaker < 3 min. / Regular Strength 4-5 min. / Stronger > 6-8 min*
Sugar:	Not recommended
Milk:	Not recommended
Lemon:	Not recommended
Fresh Mint Sprig:	Not recommended
Energy Saving Tip:	Don't over-fill your kettle. Boil only the water you need for the amount of tea you are serving. It is recommended that you use about 40-50ml (2-4 ounces) more water then required to account for steam loss and avoiding any residual calcification in your kettle being poured into your tea. *** Note: The longer brewing time for stronger tea, may be too astringent for some tastes – but, more polyphenols will be extracted!*

Hot tea brewing method:

Traditional method *(see note below)*: When preparing by the cup, this tea can be used repeatedly - about 3 times. The secret is to use water that is about 180°F/82°C. Place 1 slightly heaping teaspoon in your cup let the tea steep for about 3 minutes and then begin enjoying a cup of enchantment - do not remove the leaves from the cup. Adding milk and sugar is not recommended. Once the water level is low - add more water, and so on and so on - until the flavor of the tea is exhausted. Look at the pattern of the leaves in the brew, not only do they foretell your fortune but you can see the bud and shoots presenting themselves, looking like they are about to be plucked.

Modern Method: Bring filtered or freshly drawn cold water to a rolling boil. Place 1 slightly heaping teaspoon of loose tea, 1 tea bag or 1 Q3 portion control pack for each 7-9oz/200-260ml of fluid volume in the teapot. Pour the boiling water into the teapot. Cover and let steep for 3-7 minutes according to taste (the longer the steeping time the stronger the tea). Adding milk or sugar is not recommended.

Note: Traditionally, the recommendation has been that green tea be brewed at 180°F/82°C. Regretfully, modern society makes it necessary to consider that water may not be free of harmful bacteria and other impurities. Therefore you need to boil water to kill bacteria. If you wish to use traditional brewing temperatures bring the water to a boil and allow it to cool to the desired brewing temperature – it's the food safe thing to do!

SERVING THIS AS ICED TEA IS GENERALLY NOT RECOMMENDED. HOWEVER, SHOULD YOU WISH TO BREW IT ANYWAY, PLEASE FOLLOW THE INSTRUCTIONS BELOW:

Iced tea brewing method (*Pitcher*): (to make 1 liter/quart): Place 6 slightly heaping teaspoons of loose tea, 6 tea bags or 6 Q3 portion packs into a teapot or heat resistant pitcher. Using filtered or freshly drawn cold water, boil and pour 1¼ cups/315ml over the tea. Steep for 5 minutes. Quarter fill a serving pitcher with cold water. Pour the tea into your serving pitcher straining the tea or removing the bags. Add ice and top-up the pitcher with cold water. A rule of thumb when preparing

fresh brewed iced tea is to increase the strength of hot tea since it will be poured over ice and diluted with cold water. (Note: Some luxury quality teas may turn cloudy when poured over ice. This is a sign of luxury quality and nothing to worry about!)

Iced tea brewing method (*Individual Serving*): Place 1 slightly heaping teaspoon of loose tea, 1 tea bag or 1 Q3 portion control pack into a teapot for each serving required. Using filtered or freshly drawn cold water, boil and pour 6-7oz/170-200ml per serving over the tea. Cover and let steep for 5 minutes. Add hot tea to a 12oz/375ml acrylic glass filled with ice, straining the tea or removing the bags. Not all of the tea will fit, allowing for approximately an additional ½ serving. A rule of thumb when preparing fresh brewed iced tea is to increase the strength of hot tea since it will be poured over ice and diluted. (Note: Some luxury quality teas may turn cloudy when poured over ice. This is a sign of luxury quality and nothing to worry about!)

RECOMMENDATION: We recommend the use of our '1 Cup of Perfect Tea' measuring spoon (Item# 11MS-1370) for best results. Please contact Metropolitan Tea to place an order.

ANTIOXIDANT BENEFIT:
More antioxidants are extracted from tea (*L. Camellia Sinesis*), or rooibos (*Asphalatus Linearis*), the longer it is brewed….and the more tea or rooibos that is used, the greater the antioxidant benefit.

FOOD SAFETY ADVISORY:
While traditionally green tea is brewed using 180°F/82°C water, in food service environments, we strongly recommend using filtered or freshly drawn cold water brought to a rolling boil when brewing all types of tea. Today's water has been known to carry viruses, parasites and bacteria. Boiling the water will kill these elements and reduce the potential incidence of water-borne illnesses.

Ideal Brewing Temperature: 100ºC/212ºF. Minimum Brewing Temperature: 90ºC/194ºF.

STORAGE GUIDELINES:

Shelf Life unopened: Loose Tea: 20 year shelf-life from production date or 2 years after opening. Store as directed.
Tea Bags/Classic: 20 year shelf-life from production date or 2 years after opening. Store as directed.
Tea Bags/Pyramid: 2 year shelf-life† from production date (opened or unopened). Store as directed.

† 2 year shelf life is due to the biodegradability of the tea bag material

Storage conditions: Unopened - ideally in a cool dry location and not in direct sunlight. After opening store in an airtight container in a cool dry location. Tea can safely be stored in vacuum pack bag - tightly fold the top of the bag over and seal with tape. **Do not refrigerate.**

INCREASE YOUR SALES!

OTHER TEAS and COMPLIMENTARY ACCESSORIES YOU MAY WISH TO CARRY
If your customers enjoy Genmaicha Yamasaki, you may also wish to consider the following award winning tea blends or accessories:

Tea Blends

* Chai Tea :	Genmaicha Chai
* Decaffeinated :	Decaffeinated Chai
* Green :	Japan Fukujyu
* Organic Green :	Organic Japan Genmaicha
* Bulk Tea Bags :	Japan Sencha Kakagawa

Accessories

* TeaBrew filter:	Biodegradable Tea Filter - *Made in Canada*
* Code 11MS-1155:	1 Pot of Perfect Tea Measuring Spoon
* Code 11MS-1370:	1 Cup of Perfect Tea Measuring Spoon
* Code 11MS-1203:	Changoi Estate Perfect Pair
* Code 11PS-1151:	English Muffin 2.5 inch snap close pincer spoon mesh infuser
* Code 11PS-1238:	Sussex Derby 2 inch snap close pincer spoon mesh infuser
* Code 11PS-1672:	Perfect 1 Cup 1.75 inch snap close pincer spoon mesh infuser
* Code 11MB-1200:	Pyramid mesh tea ball
* Code 11MB-1358:	Friends 2 inch mesh tea ball
* Code 11TR-1249:	The Perfect Sand Tea Timer
* Code 11ST-1330:	London Teapot mesh tea strainer
* Code 11ST-1333:	Empress Tea Room mesh tea strainer

* Code 11TG-1204: Hand sugar tongs
* Code 11MS-1201: Kyoto Tea Club perfect 1 cup measure spoon
* Code 11ST-1202: Kyoto Tea Club strainer

Teapots & Tea Presses
* Code 22SS-1391: Henley Teapots
* Code 22SS-1190: Kyoto Tea Club Teapot
* Code 22SS-1188: Painted Ladies Teapots
* Code 21CE-2702: Ceramic Teapots
* Code 21CE-2706: Ceramic Teapots
* Code 21PC-2722: The Raffles Collection – porcelain teapot, cream and sugar and teacup
* Code 31PR-2751: Dimbula Tea Press 2 cup (4 cup and 6 cup also available)
* Code 31PR-2781: Bengal Club Tea Press 2 cup (4 cup and 6 cup also available)
* Code 31PR-2741: North Bank Tea Press 2 cup (4 cup also available)

Prepacked Tea in Tea Bags
* Code 64TN-1450-519 – Tin Caddy with 24 Tea Bags : Japan Sencha
* Code 63CT-413B-028 – 10 Tea Bags Mini Pack : Jasmine, Green Tea
* Code 63CT-510 -028 – 5 Tea Bags Sample Pack : Green Tea
* Code 62WD-618B-519 – 25 Tea Bags in Wood Box : Japan Sencha
* Code 63CT-630 -028 – 30 Foil Wrapped Tea Bags : Green Tea
* Code T1EV-FE -028 – 200 Foil Wrapped Tea Bags : Green Tea

Prepacked Loose Tea
* Discovery Loose Tea Packs

HEALTH AND WELLNESS NOTES:

• Green tea comes from the same plant as black, white or oolong 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.
• In laboratory tests commissioned by The Metropolitan Tea Company Ltd, results noted that premium green 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.
• One Japanese study concluded that women who drank 10 Japanese size (about 3 ounces) cups of green tea per day were likely to live cancer free for 7.3 years longer than those that drank less quantities of green tea.
• Green, black and oolong tea contain compounds with antioxidant and anti-inflammatory properties. It is green that that is most often found in anti-wrinkle creams.
• 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.
• Researchers found that routine intake of green tea may also help promote healthy teeth and gums.
• Instead of drinking green tea, some people apply green tea bags to their skin to soothe sunburn and prevent skin cancer due to sun exposure. Green tea bags are also used to decrease puffiness under the eyes, as a compress for tired eyes or headache, and to stop gums from bleeding after a tooth is pulled.
• A specific green tea extract ointment (Veregen, Bradley Pharmaceuticals) is FDA-approved for treating genital warts.
• Green tea is also used in an attempt to minimize the effects of Crohn's disease, Parkinson's disease, diseases of the heart and blood vessels, diabetes, low blood pressure, chronic fatigue syndrome (CFS), dental cavities (caries), kidney stones, and skin damage.

TRADITIONAL, THERAPEUTIC AND FOLK MEDICINE USE NOTES:

- A millennium ago, Japanese medicinal practitioners used green tea as a stimulant, a diuretic to reduce excess water in the body, an astringent to control bleeding and disinfect wounds and to improve heart health.
- Other historical uses of green tea included treating excess gas, regulating body temperature, controlling blood sugar, facilitating digestion and improving mental clarity.

INTERESTING SCIENTIFIC NOTES ABOUT THE TEA AND HERBS IN THIS BLEND:

Please also log into www.metrotea.com. As new abstracts become available we will post them in the 'Customer Zone'

(These notes are published by accredited researchers. Their findings may or may not be accepted by the USFDA, CFIA or any other governmental bodies in other countries of the world. The Metropolitan Tea Company Ltd does not take any responsibility

for the accuracy or veracity of these researchers' findings. If you wish to learn more, The Metropolitan Tea Company recommends that you conduct further research and consult your doctor.)

Green tea consumption and cognitive function: a cross-sectional study from the Tsurugaya Project
Abstract no: American Journal of Clinical Nutrition, Vol. 83, No. 2, 355-361, February 2006

BACKGROUND:: Although considerable experimental and animal evidence shows that green tea may possess potent activities of neuroprotection, neurorescue, and amyloid precursor protein processing that may lead to cognitive enhancement, no human data are available. OBJECTIVE: The objective was to examine the association between green tea consumption and cognitive function in humans. Design: We analyzed cross-sectional data from a community-based Comprehensive Geriatric Assessment (CGA) conducted in 2002. The subjects were 1003 Japanese subjects aged ≥70 y. They completed a self-administered questionnaire that included questions about the frequency of green tea consumption. We evaluated cognitive function by using the Mini-Mental State Examination with cutoffs of <28, <26, and <24 and calculated multivariate-adjusted odds ratios (ORs) of cognitive impairment. RESULTS:: Higher consumption of green tea was associated with a lower prevalence of cognitive impairment. At the <26 cutoff, after adjustment for potential confounders, the ORs for the cognitive impairment associated with different frequencies of green tea consumption were 1.00 (reference) for ≤3 cups/wk, 0.62 (95% CI: 0.33, 1.19) for 4–6 cups/wk or 1 cup/d, and 0.46 (95% CI: 0.30, 0.72) for ≥2 cups/d (P for trend = 0.0006). Corresponding ORs were 1.00 (reference), 0.60 (95% CI: 0.35, 1.02), and 0.87 (95% CI: 0.55, 1.38) (P for trend = 0.33) for black or oolong tea and 1.00 (reference), 1.16 (95% CI: 0.78, 1.73), and 1.03 (95% CI: 0.59, 1.80) (P for trend = 0.70) for coffee. The results were essentially the same at cutoffs of <28 and <24. CONCLUSION: A higher consumption of green tea is associated with a lower prevalence of cognitive impairment in humans.

Anti-inflammatory Activity of Soy and Tea in Prostate Cancer
- *Abstract no: Wolters Kluwer Health 2010 June 1*

Prostate cancer is the leading cancer-related cause of death for men in the USA. Prostate cancer risk is significantly lower in Asian countries compared with the USA, which has prompted interest in the potential chemo-preventative action of soy and green tea that are more predominant in Asian diets. It has been proposed that chronic inflammation is a major risk factor of prostate cancer, acting as both an initiator and promoter. Specifically, the nuclear factor-kappaB pathway has been implicated as an important mediator between chronic inflammation, cell proliferation and prostate cancer. Dietary factors that inhibit inflammation and NF-kappaB may serve as effective chemo-preventive agents. Recent studies have demonstrated that soy and green tea have anti-inflammatory properties, and may have the potential to block the inflammatory response during cancer progression. This minireview discusses the relationship between chronic inflammation and prostate cancer, emphasizing on the significance of ND-kappaB, and futher explores the anti-inflammatory effects of soy and green tea. Finally, we propose that dietary strategies that incorporate these bioactive food components as whole foods may be a more effective means to target pathways that contribute to prostate cancer development.

New Evidence That Green Tea May Help Fight Glaucoma and Other Eye Diseases
- *Abstract No: ScienceDaily (Feb. 20, 2010)*

Scientists have confirmed that the healthful substances found in green tea -- renowned for their powerful antioxidant and disease-fighting properties -- do penetrate into tissues of the eye. Their new report, the first documenting how the lens, retina, and other eye tissues absorb these substances, raises the possibility that green tea may protect against glaucoma and other common eye diseases. Chi Pui Pang and colleagues point out that so-called green tea "catechins" have been among a number of antioxidants thought capable of protecting the eye. Those include vitamin C, vitamin E, lutein, and zeaxanthin. Until now, however, nobody knew if the catechins in green tea actually passed from the stomach and gastrointestinal tract into the tissues of the eye. Pang and his colleagues resolved that uncertainty in experiments with laboratory rats that drank green tea. Analysis of eye tissues showed beyond a doubt that eye structures absorbed significant amounts of individual catechins. The retina, for example, absorbed the highest levels of gallocatechin, while the aqueous humor tended to absorb epigallocatechin. The effects of green tea catechins in reducing harmful oxidative stress in the eye lasted for up to 20 hours. "Our RESULTS: indicate that green tea consumption could benefit the eye against oxidative stress," the report concludes.

Matcha, a powdered green tea, ameliorates the progression of renal and hepatic damage in type 2 diabetic OLETF rats.
- *Abstract No: Journal of medicinal food, 2009 Aug, 12(4):714-721*

Matcha, a powdered green tea produced by grinding with a stone mill, has been popularly used in the traditional tea ceremony and foods in Japan. Matcha is well known to be richer in some nutritional elements and epigallocatechin

3-O-gallate than other green teas. In our previous study, epigallocatechin 3-O-gallate exhibited protective effects against renal damage in a rat model of diabetic nephropathy. In the present study, we investigated the preventive effects of Matcha (50, 100, or 200 mg/kg/day) on the progression of hepatic and renal damage in type 2 diabetic Otsuka Long-Evans Tokushima Fatty (OLETF) rats. OLETF rats were orally administered Matcha for 16 weeks, and we assessed biochemical parameters in the serum, liver, and kidney and expression levels of major products of advanced glycation end products (AGEs), N(6)-(carboxylmethyl)lysine (CML) and N(6)-(carboxylethyl)lysine (CEL), receptor for AGE (RAGE), and sterol regulatory element binding proteins (SREBPs)-1 and -2. Serum total protein levels were significantly increased by Matcha administration, whereas the serum albumin and glycosylated protein levels as well as the renal glucose and triglyceride levels were only slightly or not at all affected. However, Matcha treatment significantly lowered the glucose, triglyceride, and total cholesterol levels in the serum and liver, renal AGE levels, and the serum thiobarbituric acid-reactive substances levels. In addition, Matcha supplementation resulted in decreases in the renal CML, CEL, and RAGE expressions as well as an increase in hepatic SREBP-2 expression, but not that of SREBP-1. These results suggest that Matcha protects against hepatic and renal damage through the suppression of renal AGE accumulation, by decreases in hepatic glucose, triglyceride, and total cholesterol levels, and by its antioxidant activities.

Determination of catechins in matcha green tea by micellar electrokinetic chromatography.
Abstract no: Journal of chromatography. A, 2003 Sep 5, 1011(1-2):173-180

Catechins in green tea are known to have many beneficial health properties. Recently, it has been suggested that matcha has greater potential health benefits than other green teas. Matcha is a special powdered green tea used in the Japanese tea ceremony. However, there has been no investigation to quantitate the catechin intake from matcha compared to common green teas. We have developed a rapid method of analysis of five catechins and caffeine in matcha using micellar electrokinetic chromatography. results are presented for water and methanol extractions of matcha compared with water extraction of a popular green tea. Using a mg catechin/g of dry leaf comparison, results indicate that the concentration of epigallocatechin gallate (EGCG) available from drinking matcha is 137 times greater than the amount of EGCG available from China Green Tips green tea, and at least three times higher than the largest literature value for other green teas.

Green Tea Catechins: Inhibitors of Glycerol-3-Phosphate Dehydrogenase
- *Abstract no: PLANTA MEDICA,vol.76,no.7,pp.694-696,2010*

Green tea catechins, especially (-)-epigallocatechin-3-gallate (EGCG), are known to regulate obesity and fat accumulation.

We performed a kinetic analysis in a cell-free system to determine the mode of inhibition of glycerol-3-phosphate dehydrogenase (GPDH; EC 1.1.1.8) by EGCG. GPDH catalyzes the beta-nicotinamide adenine dinucleotide (NADH)-dependent reduction of dihydroxyacetone phosphate (DHAP) to yield glycerol-3-phosphate, which serves as one of the major precursors of triacylglycerols. We found that EGCG dose-dependently inhibited GPDH activity at a concentration of approximately 20 mu M for 50% inhibition. The IC50 values of other green tea catechins, such as (-)-epicatechin, (-)-epicatechin-3-gallate, and (-)-epigallocatechin, were all above 100 mu M. This suggests a catechin type-dependent effect. Based on double-reciprocal plots of the kinetic data, EGCG was a noncompetitive inhibitor of the GPDH substrates, NADH and DHAP, with respective inhibition constants (Ki) of 18 and 31 mu M. results of this study possibly support previous studies that EGCG mediates fat content.

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.

Green tea extract selectively activates peroxisome proliferator-activated receptor β/δ in cultured cardiomyocytes

- *Abstract no: British Journal of Nutrition (2002), 87 : 343-355 Cambridge University Press*

Hypoxia/reoxygenation is one of the causes of the increased expression of inducible NO synthase in cardiomyocytes.

In a recent study we demonstrated that a single, high dose of green tea *extract (GT) supplemented to the medium of cultured cardiomyocytes just before hypoxia/reoxygenation is able to prevent the increased expression of inducible NO synthase, therefore reducing NO overproduction. In the present study we investigated the mechanism by which GT reduces NO production. Since a molecular mechanism for polyphenol activity has been postulated, and PPAR activation is related to the transcription of the inducible NO synthase gene, we evaluated the activation of PPAR by GT. A moderate GT concentration, supplemented to the cardiomyocyte medium since the initial seeding, selectively activated the PPAR-β/δ isoform. Furthermore, we observed a reduction in NO production and an increase in total antioxidant activity, indicating that GT components may act on both reactive oxygen species,* via *an antioxidant mechanism, and NO overproduction. PPAR-β/δ activation could represent the key event in the reduction of NO production by GT. Although PPAR activation by GT was lower than activation by fenofibrate, it is very interesting to note that it was selective for the β/δ isoform, at least in neonatal cardiomyocytes.*

Green tea drinking and the acid-producing bacteria of the human mouth

- *Abstract no: Bios, Vol. 74, No. 2 (May, 2003), pp. 43-47*

Abstract. Green tea drinking and the acid-producing bacteria of the human mouth were examined. Thirty-six males and 40 females drank one cup of green tea a day for 28 days. Saliva was collected from this one group of individuals on days 0, 7, and 28, and the amount of acid-producing bacteria was determined. For both males and females, there were significantly fewer acid-producing bacteria in the saliva samples collected on day 7 than on day 0. Samples collected on day 28 also had significantly less acid-producing bacteria than those collected on days 0 and 7.

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.

Green tea, black tea, and epigallocatechin modify body composition, improve glucose tolerance, and differentially alter metabolic gene expression in rats fed a high-fat diet.

- Abstract No: Nutrition research (New York, N.Y.), 2009 Nov, 29(11):784-793

The mechanisms of how tea and epigallocatechin-3-gallate (EGCG) lower body fat are not completely understood.

This study investigated long-term administration of green tea (GT), black tea (BT), or isolated EGCG (1 mg/kg per day) on body composition, glucose tolerance, and gene expression related to energy metabolism and lipid homeostasis; it was hypothesized that all treatments would improve the indicators of metabolic syndrome. Rats were fed a 15% fat diet for 6 months from 4 weeks of age and were supplied GT, BT, EGCG, or water. GT and BT reduced body fat, whereas GT and EGCG increased lean mass. At 16 weeks GT, BT, and EGCG improved glucose tolerance. In the liver, GT and BT increased the expression of genes involved in fatty acid synthesis (SREBP-1c, FAS, MCD, ACC) and oxidation (PPAR-alpha, CPT-1, ACO); however, EGCG had no effect. In perirenal fat, genes that mediate adipocyte differentiation were suppressed by GT (Pref-1, C/EBP-beta, and PPAR-gamma) and BT (C/EBP-beta), while decreasing LPL, HSL, and UCP-2 expression; EGCG increased expression of UCP-2 and PPAR-gamma genes. Liver triacylglycerol content was unchanged. The results suggest that GT and BT suppressed adipocyte differentiation and fatty acid uptake into adipose tissue, while increasing fat synthesis and oxidation by the liver, without inducing hepatic fat accumulation. In contrast, EGCG increased markers of thermogenesis and differentiation in adipose tissue, while having no effect on liver or muscle tissues at this dose. These results show novel and separate mechanisms by which tea and EGCG may improve glucose tolerance and support a role for these compounds in obesity prevention.

Green tea polyphenol epigallocatechi3-gallate: Inflammation and arthritis

- *Abstract no: LIFE SCIENCES,vol.86,no.25-26,pp.907-918,2010*

A number of factors including inflammation and oxidative stress are believed to play a role in the development of chronic joint diseases. Green tea has become a popular drink and is consumed throughout the world. Extracts of green tea and polyphenols present therein have been shown to inhibit the inflammatory responses in vitro in different cell types and the development of arthritis in animal model studies. There inconsiderable evidence that (-)-epigallocatechin-3-gallate (EGCG), the predominant green tea polyphenol which mimic its effects, inhibits enzyme activities and signal transduction pathways that play important roles in inflammation and joint destruction in arthritis. After oral consumption EGCG become bioavailable and proteomic studies suggest that EGCG may directly interact with a large set of protein targets and alter the physiological response of the cells. Taken together these and other studies identify and support the use of EGCG as a possible chemopreventive agent with a potential to inhibit the development of arthritis. Here we review the biological effects of EGCG in an attempt to understand its pivotal molecular targets that directly affect the inflammation and joint destruction process for prevention and/or for the development of new therapeutics for arthritis in humans.

Green* tea *catechin enhances cholesterol 7α-hydroxylase gene expression in HepG2 cells

- *Abstract no: British Journal of Nutrition (2008), 99:1182-1185 Cambridge University Press*

Green tea *catechins are known to have hypocholesterolaemic effects in animals and human subjects. In the present study, we investigated the effects of green* tea *catechins on the mRNA level and promoter activity of hepatic cholesterol 7α-hydroxylase (CYP7A1), the rate-limiting enzyme in the conversion of cholesterol to bile acids, in human hepatoma cells. Real-time PCR assays showed that different catechins, (−)-epicatechin gallate (ECG), (−)-epigallocatechin-3-gallate (EGCG), (−)-epigallocatechin (EGC) and (−)-epicatechin (EC), up regulated the CYP7A1 mRNA level by 5·5-, 4·2-, 2·9- and 1·9-fold, respectively, compared with the control. The − 1312/+358 bp of the CYP7A1 promoter was subcloned into the pGL3 basic vector that includes luciferase as a reporter gene. ECG or EGCG significantly increased CYP7A1 promoter activity by 6·0- or 4·0-fold, respectively, compared with the control. Also, EGCG stimulated CYP7A1 at both mRNA level and promoter activity in a dose-dependent manner. These results suggest that the expression of the CYP7A1 gene may be directly regulated by green* tea *catechins at the transcriptional level.*

Potential Therapeutic Properties of Green Tea Polyphenols in Parkinson's Disease

- *Abstract no: Drugs & Aging, Volume 20, Number 10, 2003 , pp. 711-721(11)*

Tea is one of the most frequently consumed beverages in the world. It is rich in polyphenols, a group of compounds that exhibit numerous biochemical activities.

Green tea is not fermented and contains more catechins than black tea or oolong tea. Although clinical evidence is still limited, the circumstantial data from several recent studies suggest that green tea polyphenols may promote health and reduce disease occurrence, and possibly protect against Parkinson's disease and other neurodegenerative diseases.Green tea polyphenols have demonstrated neuroprotectant activity in cell cultures and animal models, such as the prevention of neurotoxin-induced cell injury. The biological properties of green tea polyphenols reported in the literature include antioxidant actions, free radical scavenging, iron-chelating properties, ^{3}*H-dopamine and* ^{3}*H-methyl-4-phenylpyridine uptake inhibition, catechol-O-methyltransferase activity reduction,*

protein kinase C or extracellular signal-regulated kinases signal pathway activation, and cell survival/cell cycle gene modulation. All of these biological effects may benefit patients with Parkinson's disease.Despite numerous studies in recent years, the understanding of the biological activities and health benefits of green tea polyphenols is still very limited. Further in-depth studies are needed to investigate the safety and efficacy of green tea in humans and to determine the different mechanisms of green tea in neuroprotection.

Green tea: A promising anticancer agent for renal cell carcinoma

- *Abstract no: FOOD CHEMISTRY,vol.122,no.1,pp.49-54,2010*

Renal cell carcinoma (RCC) is one of the most lethal amongst the urologic malignancies, comprising three percent of all human neoplasms, and its incidence appears to be rising.

RCC is refractory to both chemotherapy and radiotherapy. Therefore, the discovery of new strategies for therapeutic intervention remains a priority. Green tea (Camellia sinensis) and tea polyphenols have been proposed to exert protective effects against several types of cancer, based on preclinical and clinical trial data; however, the anticarcinogenic activity of green tea towards RCC is unknown. In this study, a targeted metabolite analysis on a green tea leaves methanolic extract was performed by HPLC/DAD and the antiproliferative activity of the extract was assayed using human renal cancer cell lines A-498 and 769-P. The total phenolic content was very high (31.8% of methanolic extract), and the main compounds were flavan-3-ols (94.3% of the total phenolic content), and especially (-)-epigallocatechin-3-gallate (35.9% of the total phenolic content). In addition, two methylxanthines - theophylline and caffeine - were also present in the extract, caffeine being the most abundant. Green tea extract strongly inhibited the growth of both RCC cell lines in a concentration-dependent manner, with IC50 values of 54 +/- 10 and 129 +/- 28 mu g/ml for A-498 and 769-P cells, respectively. This is the first report showing that green tea is likely to be an effective anticancer agent for renal cell carcinoma.

An aqueous extract of green tea Camellia sinensis increases expression of Th1 cell-specific anti-asthmatic markers

- *Abstract no: INTERNATIONAL JOURNAL OF MOLECULAR MEDICINE,vol.22,no.6,pp.763-767,2008*

The present study provides evidence of the antiasthmatic signaling activity of all aqueous fraction of green tea using specific in vitro and in vivo assays in all ovalbumin-induced asthmatic model.

Mice sensitized to ovalbumin were orally administered an aqueous extract of Camellia sinensis. The lungs of these mice were then examined by hematoxylin and eosin staining and ELISA analysis to measure cytokine expression. The aqueous extract of Camellia sinensis exhibited potent anti-asthmatic activity by increasing the expression level Of tumor necrosis factor-beta and interferon-gamma and decreasing the expression of anti-asthmatic cytokines ill the lung. Together. these results indicate that the aqueous fraction of Camellia sinensis is effective in alleviating asthmatic symptoms by increasing the expression of Th1 cell-specific anti-asthmatic biomarkers.

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 radioenzymatic 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 NO concentration was seen.* CONCLUSION: *These results suggest that green tea and Rooibos tea may have cardiovascular effects through inhibition of ACE activity.*

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.

Green tea and bone metabolism.

- Abstract No: Nutrition research (New York, N.Y.), 2009 Jul, 29(7):437-456

Osteoporosis is a major health problem in both elderly women and men. Epidemiological evidence has shown an association between tea consumption and the prevention of age-related bone loss in elderly women and men.

Ingestion of green tea and green tea bioactive compounds may be beneficial in mitigating bone loss of this population and decreasing their risk of osteoporotic fractures. This review describes the effect of green tea or its bioactive components on bone health, with an emphasis on (i) the prevalence and etiology of osteoporosis; (ii) the role of oxidative stress and antioxidants in osteoporosis; (iii) green tea composition and bioavailability; (iv) the effects of green tea and its active components on osteogenesis, osteoblastogenesis, and osteoclastogenesis from human epidemiological, animal, as well as cell culture studies; (v) possible mechanisms explaining the osteoprotective effects of green tea bioactive compounds; (vi) other bioactive components in tea that benefit bone health; and (vii) a summary and future direction of green tea and bone health research and the translational aspects. In general, tea and its bioactive components might decrease the risk of fracture by improving bone mineral density and supporting osteoblastic activities while suppressing osteoclastic activities.

Protective effect of green tea polyphenols on bone loss in middle-aged female rats

- Abstract no: Osteoporosis International 2007 December 15

Recent studies have suggested that green tea polyphenols (GTP) are promising agents for preventing bone loss in women. Findings that GTP supplementation resulted in increased urinary GTP concentrations and bone mass via an increase of antioxidant capacity and/or a decrease of oxidative stress damage suggest a significant role of GTP in bone health of women.This study evaluated bioavailability, mechanisms, bone mass, and safety of GTP in preventing bone loss in middle-aged rats without and with ovariectomy. A 16 week study using 14 months old female rats was performed. We conclude that a bone-protective role of GTP may contribute to an increase of antioxidant capacity and/or a decrease of oxidative stress damage.

Green tea consumption and breast cancer risk or recurrence: a meta-analysis

- Abstract no: Breast Cancer Research and Treatment 2009 May 13

Green tea is a commonly consumed beverage in Asia and has been suggested to have anti-inflammatory and possible anti-carcinogenic properties in laboratory studies. We sought to examine the association between green tea consumption and risk of breast cancer incidence or recurrence, using all available epidemiologic evidence to date. We conducted a systematic search of five databases and performed a meta-analysis of studies of breast cancer risk and recurrence published between 1998 and 2009, encompassing 5617 cases if breast cancer. We identified two studies of breast cancer recurrence and seven studies of breast cancer incidence. Increased green tea consumption (more than three cu[s a day) was inversely associated with breast cancer recurrence. Available epidemiologic evidence supports the hypothesis that increased green tea consumption may be inversely associated with risk of breast cancer recurrence.

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, on 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.

Prevention of oxidative DNA damage in inner organs and lymphocytes of rats by green tea extract

- *Abstract no: European Journal of Nutrition [Eur. J. Nutr.]. Vol. 49, no. 4, pp. 227-234. Jun 2010*

BACKGROUND: Consumption of green tea (GT) is associated with decreased incidences of specific forms of cancer in humans and it was postulated that its antioxidant (AO) properties may account for these effects.
The evidence for AO effects of GT is mainly based on the RESULTS: from in vitro experiments and on animal studies in which protection against chemically induced damage was monitored. Aim of the study: The goal of the study was the investigation of the prevention of strand breaks and DNA migration attributable to endogenous oxidation of bases by GT extract (GTE) in inner organs and lymphocytes of untreated rats. In addition, immunological parameters and biochemical markers were monitored. METHODS: DNA migration was measured in hepatocytes, colonocytes and lymphocytes after consumption of a low (1.3mg/kg bw per day, 5days) and a high dose (6.5mg/kg bw per day, 5days) of GTE in COMET assays (n=5 animals per group). In addition, immunological parameters (TNF- alpha , IFN- gamma , IL-4 and IL-10), the total AO capacity and oxidized low-density lipoproteins were determined in plasma. RESULTS: No evidence for reduction in DNA damage was found with a lower dose, whereas with the higher dose, reduction in DNA migration attributable to formamidopyrimidine-DNA-glycosylase sensitive lesions (oxidized purines) and endonuclease III-sensitive sites (oxidized pyrimidines) (58 and 73%) was observed in lymphocytes; also, in colonocytes (reduction in FPG-sensitive sites by 46%) and hepatocytes (decrease in Endo III-sensitive sites by 74%) protective effects were found, while none of the other parameters was altered. CONCLUSION: Our RESULTS: show that a dose of GTE, which is equivalent to consumption of 500ml GT/p/day in humans protects lymphocytes and to a lesser extent inner organs against oxidative DNA damage, while no effect was seen with a lower dose corresponding to an uptake of 100ml/p/day.

Green tea (Camellia sinensis) catechins and vascular function

- *Abstract No: BRITISH JOURNAL OF NUTRITION,vol.102,no.12,pp.1790-1802,2009*

The health benefits of green tea (Camellia sinensis) catechins are becoming increasingly recognised.

Amongst the proposed benefits are the maintenance of endothelial function and vascular homeostasis and an associated reduction in atherogenesis and CVD risk. The mounting evidence for the influential effect of green tea catechins on vascular function front epidemiological, human intervention and animal studies is subject to review together with exploration of the potential mechanistic pathways involved. Epigallocatechin-3-gallate, one of the most abundant and widely studied catechin found in green tea, will be prominent in the present review. Since there is a substantial inconsistency in the published data with regards to the impact of green tea catechins on vascular function, evaluation and interpretation of the inter- and intra-stud variability is included. In CONCLUSION: a positive effect of green tea catechins on vascular function is becoming apparent. Further studies in animal and cell models using physiological concentrations of catechins and their metabolites are warranted in order to gain some insight. into the physiology and molecular basis of the observed beneficial effects.

Antimicrobial activity and biofilm formation inhibition of green tea polyphenols on human teeth

- *Abstract no: Biotechnology and Bioprocess Engineering [Biotechnol. Bioprocess. Eng.]. Vol. 15, no. 2, pp. 359-364. Apr 2010.*

The antimicrobial effects and biofilm formation inhibition of tea polyphenols (TPP) extracted from Korean green tea (Camellia sinensis L) were evaluated against 12 oral microorganisms. Effective antimicrobial activity against all microorganisms tested, including Lactobacillus spp. (Lactobacillus acidophilus and Lactobacillus plantarum), Streptococcus spp. (Streptococcus mutans, Streptococcus sanguis, Streptococcus sobrinus, Streptococcus mitis, and Streptococcus salivarius), Staphylococcus aureus, Neisseria meningitidis, Escherichia coli, Enterobacter cloacae, Enterococcus faecalis, and Candida albicans, was shown at 2,000 mu g/mL TPP within 5 min of incubation. Scanning electron microscopy (SEM) analysis revealed various morphological changes, such as the presence of perforations, the formation of cell aggregates, and the leakage of cytoplasmic materials from cells treated with TPP, depending on the bacteria. The potential role of TPP in biofilm formation inhibition on human teeth was evaluated in BHI broth with 2 mixed strains of S. mutans and S. sanguis. SEM analysis showed biofilm formation on the surface of a tooth shaken only in saline solution, whereas almost no biofilm was observed on a tooth incubated in TPP solution. This result suggests that TPP is effective against adherent cells of S. mutans and S. sanguis. Thus, TPP would be useful for development as an antimicrobial agent against oral microorganisms, and has great potential for use in mouthwash solutions for the prevention and treatment of dental caries.

Green tea drinking and the acid-producing bacteria of the human mouth

- *Abstract no: Bios, Vol. 74, No. 2 (May, 2003), pp. 43-47*

Abstract. Green tea drinking and the acid-producing bacteria of the human mouth were examined. Thirty-six males and 40 females drank one cup of green tea a day for 28 days. Saliva was collected from this one group of individuals on days 0, 7, and 28, and the amount of acid-producing bacteria was determined. For both males and females, there were significantly fewer acid-producing bacteria in the saliva samples collected on day 7 than on day 0. Samples collected on day 28 also had significantly less acid-producing bacteria than those collected on days 0 and 7.

Green tea consumption and cognitive function: a cross-sectional study from the Tsurugaya Project

- *Abstract no: American Journal of Clinical Nutrition, Vol. 83, No. 2, 355-361, February 2006*

BACKGROUND:Although considerable experimental and animal evidence shows that green tea may possess potent activities of neuroprotection, neurorescue, and amyloid precursor protein processing that may lead to cognitive enhancement, no human data are available. OBJECTIVE: The objective was to examine the association between green tea consumption and cognitive function in humans. Design: We analyzed cross-sectional data from a community-based Comprehensive Geriatric Assessment (CGA) conducted in 2002. The subjects were 1003 Japanese subjects aged ≥70 y. They completed a self-administered questionnaire that included questions about the frequency of green tea consumption. We evaluated cognitive function by using the Mini-Mental State Examination with cutoffs of <28, <26, and <24 and calculated multivariate-adjusted odds ratios (ORs) of cognitive impairment. RESULTS:: Higher consumption of green tea was associated with a lower prevalence of cognitive impairment. At the <26 cutoff, after adjustment for potential confounders, the ORs for the cognitive impairment associated with different frequencies of green tea consumption were 1.00 (reference) for ≤3 cups/wk, 0.62 (95% CI: 0.33, 1.19) for 4–6 cups/wk or 1 cup/d, and 0.46 (95% CI: 0.30, 0.72) for ≥2 cups/d (P for trend = 0.0006). Corresponding ORs were 1.00 (reference), 0.60 (95% CI: 0.35, 1.02), and 0.87 (95% CI: 0.55, 1.38) (P for trend = 0.33) for black or oolong tea and 1.00 (reference), 1.16 (95% CI: 0.78, 1.73), and 1.03 (95% CI: 0.59, 1.80) (P for trend = 0.70) for coffee. The results were essentially the same at cutoffs of <28 and <24. CONCLUSION: A higher consumption of green tea is associated with a lower prevalence of cognitive impairment in humans.

Comparative Studies on the Hypolipidemic and Growth Suppressive Effects of Oolong, Black, Pu-erh, and Green Tea Leaves in Rats

- *Abstract no: Journal of Agricultural and Food Chemistry 2004 December 24*

The four major commercial teas, oolong, black, pu-erh, and green teas, have been manufactured in South-East Asia. In this study, we evaluated the growth suppressive and hypolipidemic effect of these four different tea leaves by oral feeding to male Sprague-Dawley rats for 30 weeks. The results showed that the suppression of body weight of tea leaves-fed groups were in the order: oolong tea>pu-erh tea>black tea>green tea. Pu-erh and oolong tea could lower the levels of triglyceride more significantly than that of green and black tea, but pu-erh tea and green tea were more efficient that oolong tea and black tea in lowering the level of total cholesterol. In lipoprotein, 4% pu-erh tea could increase the level of HDL-C and decrease the level of LDL-C, but other teas simply decrease the levels of both. The activity of antioxidant enzyme SOD id increased om a;; tea-fed groups as compared to the basal diet-fed group. Finally, relative weight ratios of liver to epididylmal adipose tissue were lower in feeding oolong tea and pu-erh tea groups. On the basis of these finding, it seemed that the fully fermented pu-erh and black tea leaves and partially fermented oolong tea leaves were more effective on their growth suppressive and hypolipidemic effects as compared to the nonfermented green tea leaves.

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