



Characteristics of Tea

Tea have different chemical components from other plants

- ☆ Caffeine
- ☆ Catechins of Gallate type
- ☆ Theanine (Free Amino Acid)
- ☆ Others(Fluorine, Aluminum etc.)

Tea is a Medicine originally

Shen Nong

Shen Nong was an early emperor, scholar, herbalist and the Agriculture of God in posterior.

Lu Yu

Lu Yu wrote the first definitive book about tea, Tea sutrac; Cha-Kyou.

Different kinds of Tea in the World

```

graph TD
    A[Fresh Tea Leaves] --> B[Steaming]
    A --> C[Panning]
    A --> D[Withering]
    B --> E[Rolling]
    E --> F[Drying]
    F --> G[GREEN TEA  
(Non Fermented Tea)]
    C --> H[Parching]
    H --> I[Rolling]
    I --> J[Drying]
    J --> K[BLUE TEA  
(Semi Fermented Tea)]
    D --> L[Rolling]
    L --> M[Fermentation]
    M --> N[Drying]
    N --> O[BLACK TEA  
(Fermented Tea)]
  
```

On the base of method of processing Japanese system classifies tea to three groups, however Chinese tea is basically divided into six groups: Green tea, Yellow tea, Dark tea, White tea, Blue tea, Black tea

Can make the various types of tea from the same leaves

Tea leaves	Green tea	Black tea
Catechines	Catechines	Theaflavins, Thearubigins
Chlorophyll	Chlorophyll	Pheophytin
Vitamine C	Vitamine C	Nothing(Oxide, Hydrolyzate)
Aroma	Fresh, Grassy	like flowerly or fruity

Comparison of chemical contents of green tea and black tea

Characteristic constituents of Green tea and Black tea (Dry weight)

	Green tea	Black tea
Amino acid (mg/100g)	4023.16	2355.32
Theanine (mg/100g)	875-3030	1461
Glutamic acid(mg/100g)	184-533	130
Chlorophyll(mg/g)	0.435-2.569	1.039
Carotene(mg/g)	0.0196-0.0510	0.017
Theaflavins(%)	0.00-0.33	2.31
Thearubigins(%)	0.00-11.51	14.45
EGCG(mg/g)	23.37-155.15	5.53
Total Catechins(mg/g)	36.62-279.22	17.36

Comparison of chemical contents of green tea and black tea infusion

The chemical contents of green tea and black tea infusion (Dry weight %)

	Green tea	Black tea
Total Catechin	30-42	3-10
Theaflavin	0	2- 6
Polyphenol	2	3
Flavonol	8	24
Theanine	3	3
Organic Acids	2	2
Caffeine	3-6	3-6
Vitamine C	4	0



Characteristics of Japanese Green Tea

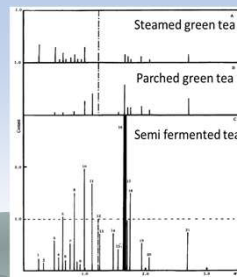
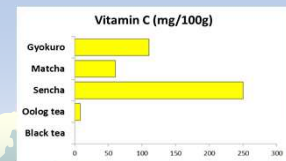


Fig.4. Gas chromatograms of steamed green tea, parched green tea and semi-fermented tea made from fresh leaves plucked on the same day. (Tadakazu TAKEO etc. 1985)



- Color of poured tea is green
- Components are quickly eluted for steam method tea
- Amino acid content is high, catechin small amount of high amino acid content
- Aroma have freshly grassy flavor
- Shape is needle-like with firmly twist
- The content of vitamin C is high
- Japanese green tea has a long history and high cultural aspect

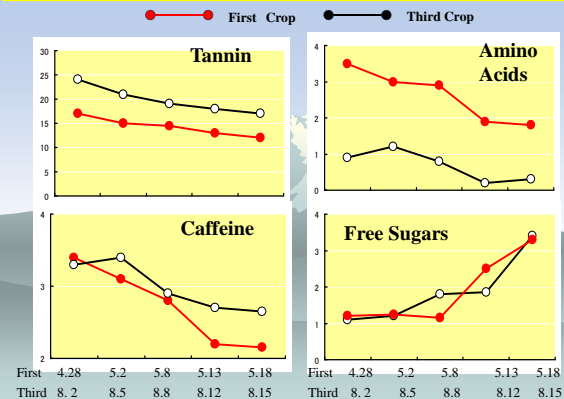
Chemical Composition of Various Leaf Order



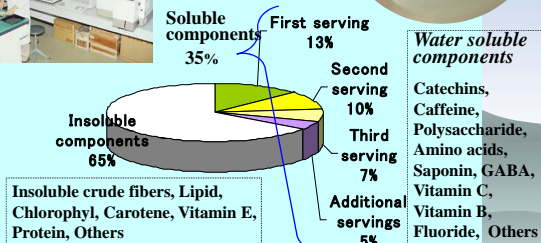
Chemical Composition of Various Leaf Order(%)

Leaf Order	Tannin	Caffeine	Amino acids	Free Sugars
One and a Bud	14.45	3.50	3.11	0.77
Second Leaf	13.02	3.00	2.92	0.81
Third Leaf	12.79	2.65	2.34	1.02
Fourth Leaf	12.69	2.37	1.95	1.59
Stem	6.23	1.31	5.73	2.61

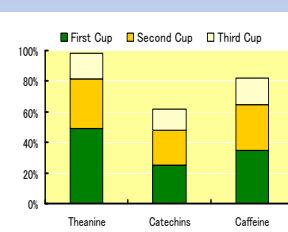
Chemical Composition on Different Crop Season



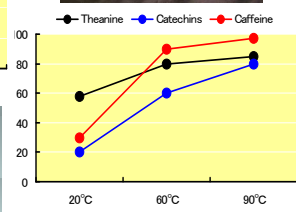
Physiological functions of Japanese green tea components



Chemical Composition of Various Pour Tea

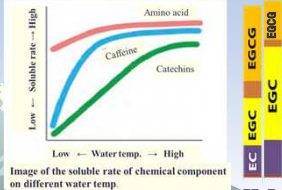


The soluble rate of chemical component with pour tea



The soluble rate of chemical component on different water temp.

The soluble rate of chemical component is different on different water temp.



The major component and the taste of tea

Amino Acids	Theanine Gultamic acid	Sweet, Umami Umami, acidity
Chtechins	Epicatechin Epigallocatechin Epicatechin gallate Epigallo catechin gallate	Bitter Bitter Astringent, Bitter Astringent, Bitter
Caffeine		Bitter

The soluble rate of Catechins

H: High water temp.
L: Low water temp.

Different Characters of function of Japanese green tea

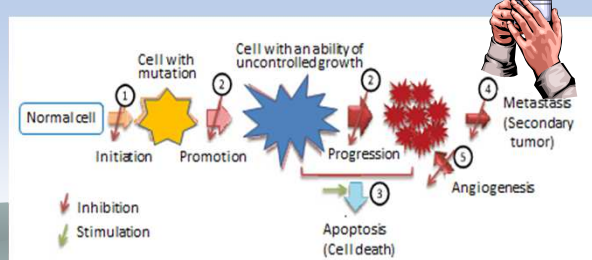


Primary Function	Nutritional Function	Vitamins Minerals	VitaminC, VitaminE, β Carotene. Potassium, Posphorus, Zinc, Manganese etc
Secondary Function	Sensory Function	Taste Aroma Color	Theanine, Amino acid, Catechins, Caffeine etc Terpene, Alcohol, Ester etc Flavonol, Theaflavins, Chlorophyll
Tertiary Function	Body Modulating Function	Catechins, Flavonol, Caffeine, Vitamins, Amino acid, Minerals etc.	

Physiological functions of green tea components

Green Tea Components	Contents	Functions
Catechins	10~18%	Anti-oxidative, radioprotective, Anti-mutagenic, Anti-tumor, Enzyme inhibitory, Anti-hypercholesterolemic, Anti-hyperglycemic, Fat reducing, Anti-hypertensive, Anti-ulcer, Anti-bacterial etc.
Caffeine	3~4%	Removal of fatigue, Sleepy feeling, Diuretic etc.
Vitamin C	150~250mg%	Removal of stress, Cold prevention
Vitamin B	1.4mg%	Excitometabolic action of carbohydrates and amino acids
Vitamin E	25~70mg%	Anti oxidative, Aging prevention
γ amino butyric acid	0.1~0.2%	Anti hypertensive
Flavonoids	0.6~0.7%	Halitosis prevention
Theanine	0.6~2%	Anti hypertensive

Cancer development and actions of tea catechins



Cancer progresses through several stages as it develops including initiation, promotion, progression, and metastasis. Green tea catechins have been shown to exert anti-cancer effects at each of these stages.

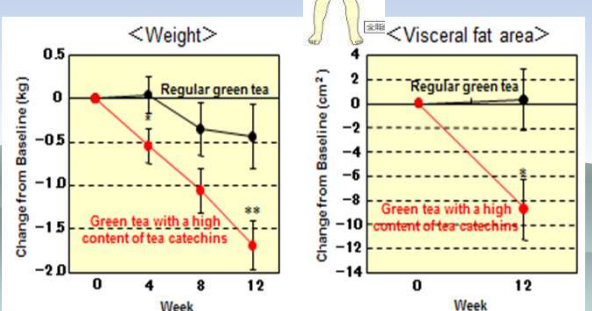
Epidemiological studies on correlation between green tea intake and the risk of human cancer

Study type	Cohort		Case-control	
	Risk reduction	No risk reduction	Risk reduction	No risk reduction
Colon	3	6	4	3
Lung	0	4	2	3
Stomach	2	6	8	8
Osophagus	0	2	4	5
Breast	3	5	3	0
Prostate	2	0	2	0
Ovaries	1	0	2	0
Pancreas	0	2	2	1
Kidney and bladder	0	1	1	4
liver	1	0	0	0
Endometrium	0	0	2	1
Thyroid	1	1	0	0
Blood	1	0	0	0

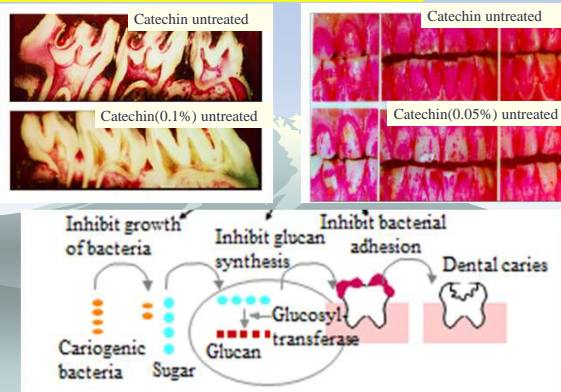
Cohort study: a group of similar individuals who differ with respect to certain factors under study to determine how these factors affect the rates of a certain outcome.

Case-control study: two existing groups differing in outcome are identified and compared on the basis of some supposed causal attribute.

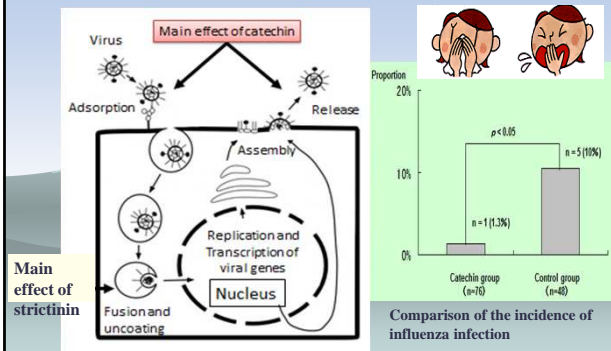
Effects of catechins on weight and visceral fat area



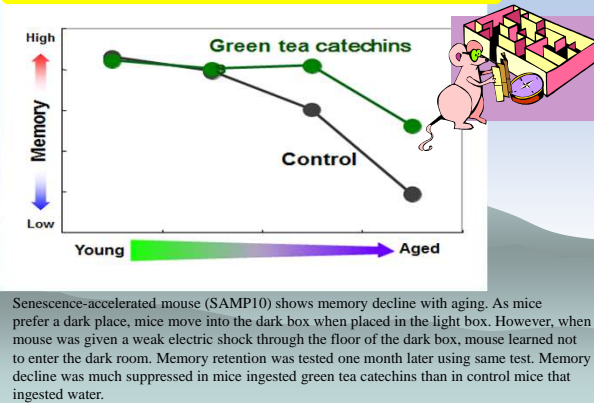
Effects of catechin on dental diseases



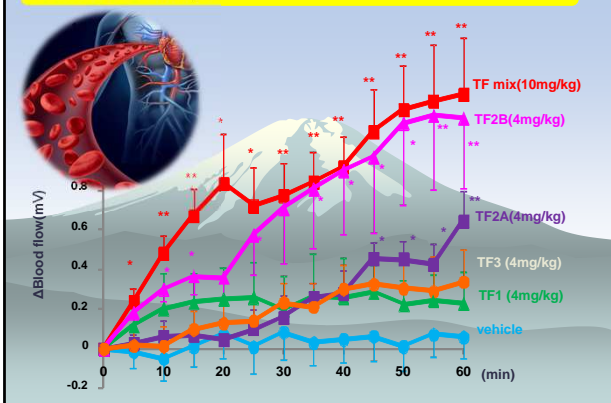
Effects of catechin and strictinin on infection and replication of the influenza virus



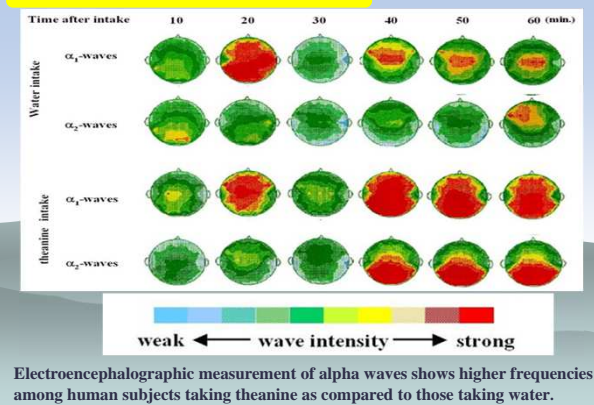
Memory retention in mice ingested catechin



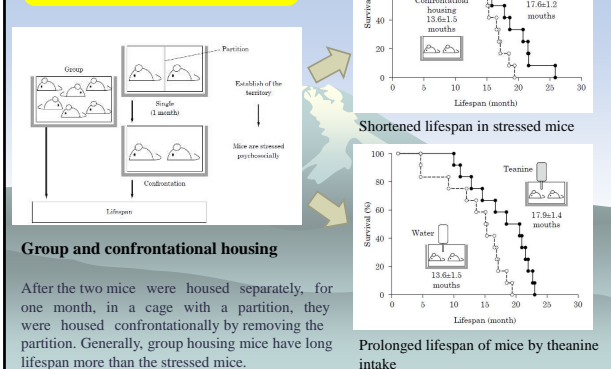
Blood flow improvement effect of theaflavins

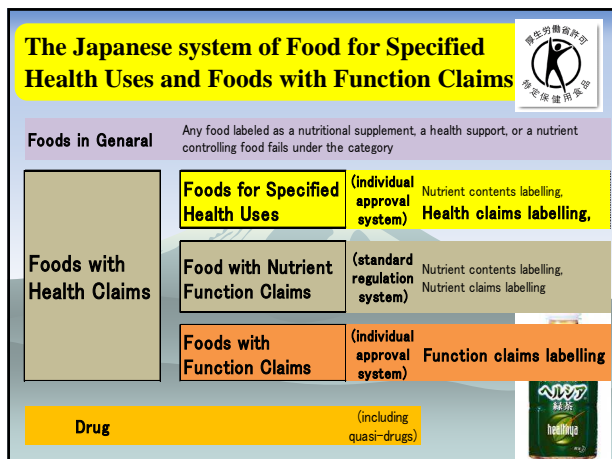


Effect of theanine on relaxation



Effect of theanine on psychosocial stress





The example of goods which focused on functionality

Classification	Fields	Goods
New Type of Tea	Utilization as tea	GABA tea, Mixed tea, Low caffeine tea, etc
	New form of tea	Packed tea, Tea bag, Matcha, Instant tea, Card type tea, Tea powder, Tea capsule, Tea tablet
Dietary Field	Beverage	Can drink, Bottle, Tetra pack, Tea wine, Sport drink
	Use for food	Tea noodle, Tea candy, Tea gum, Tea cake, Tea chocolate, Tea jelly, Tea icecream, etc
Daily Life Implement Field	Food material	Tea flavor, Tea paste, Tea essence, powdered tea
	Supplement	Catechin tablet, Water soluble catechin, Theanine tablet
	For Clothing use	Shirt, Towel, Socks, Handkerchief, Mask, Pillow etc
	For Medical use	Catechin shirt, Catechin cover, Catechin mask
	For Make-up use	Foundation, Cream, Catechin soap, Skincream, Shampoo, Bath soft, Deodorant agent etc
Others	Daily necessity	Note, paper, Tissue paper, Toilet paper, Slipper
	Others	Wax, Filter, Pet food, Pure tea polyphenol compounds



Dietary Field
~Supplement~

Supplement, Card type tea, Tea powder, Tea capsule, Tea tablet etc



Tea capsule



Tea powder
(Stick type)



Tea powder

Daily Life Implement Field
~For clothing and medical use~

Shirt, Towel, Socks, Mask, Pillow etc



Towel



Handkerchief



Pillow



Shirt, Socks



Bedding

Daily Life Implement Field
~For make-up use~

Foundation, Cream, Soap, Shampoo, Bath salt, Deodorant agent etc



Tea soap



Skin cream



Cream



Skin care cream

Daily Life Implement Field
~Daily necessity~

Note, Letter paper, Tissue paper Toilet paper, Slipper etc



Tissue paper



Deodorant tea



Sterilizer



Fan



Toilet paper



Insole of shoe

Daily Life Implement Field
~Others~

Wax, Filter, Pet food, Pure tea polyphenol compounds etc



Cat food



Catechin tatami



Sterilizer



Pet food



Insecticide

Thank you for your kind attention

