Editorial: Overview for Tea & Health Special of IJTS

At this time, the beginning of the 21st Century, tea as a beverage is favored in many countries of the World. It is said, that it is the most used drink second to water. In the writer's opinion, it is actually better than water in many parts of the world, where clean sterile water is not available. The preparation of tea involves boiling of the water, which will automatically sterilize it and therefore, makes it safe.

Tea, from the leaves of the plant *Camellia sinensis* has an ancient history of use in China and India for its health benefits and medicinal properties. The interesting feature of the tea leaf is that it contains among other beneficial elements, specific polyphenols. As harvested, the tea leaf is an important source of epigallocatechin gallate and certain other catechins. Traditionally, the leaves as collected are steamed or otherwise heated in a pan, depending on prevailing traditions, and this heating inactivates the enzyme, polyphenol oxidase present in the leaf. The resulting product is **green tea** rich in the original polyphenol. Actually, a slight modification of the process of harvesting collects not only the top 2 leaves and the bud, but also the flower that might be present. This processing yields **white tea**.

If at harvest the tea leaves collected are rolled for breaking the cell wall to release the cell contents, and incubated (wrongly termed "fermentation" in tea parlance) at about 37°C, the polyphenols oxidase present converts the polyphenols typical of green tea to other polyphenols. An incubation of about 30 minutes followed by immediate heating to inactivate the enzymes yields **oolong tea**, popular in Southern China and Taiwan. On the other hand if the incubation is prolonged to 60-90 minutes, the resulting set of polyphenols called theaflavins and thearubigens are typical of **black tea**, favored by tradition in most of the Western World.

People in a number of countries such as Ireland, the UK and also India often like to add milk to tea. With the aid of a young scientist from South Africa, Dr. Apostolides, a fellow in my laboratory, we studied the addition of the amount of milk recommended by the International Standards Organization, ISO, namely about 2% whole milk. We found that the effectiveness of tea in lowering the risk of colon and breast cancer in rats was not affected by that amount of milk. We understand, however, that larger amounts of milk are customarily added to tea in the UK and in South Asia, and it is not known what this custom would do with the health benefits of tea, discussed below.

While tea was thought to be a health promoting and, in fact, a therapeutic beverage, ever since at least 1000 years before Christian Era, detailed research on health aspects of drinking tea is quite recent. There are a number of approaches, namely studies in humans through the techniques of epidemiology, comparing tea drinkers to non-tea drinkers. It was found that tea reduces the risk of heart disease and a number of types of cancer, major premature killing diseases. In addition, there have been studies in animal models and through cell and other *in vitro* approaches, providing an approach to the mechanism of action of tea and the tea polyphenols. Most studies show that black and green teas have similar effects. The diseases mentioned often stem from a biochemical oxidation in cells through reactive oxygen species to metabolites that exert the harmful effects, in the presence of carcinogens in tobacco, or formed to cooking, or from certain polyunsaturated oils. The antioxidant properties of the tea polyphenols serve to destroy the reactive oxygen species (ROS) and account for the disease preventing affects of tea.

ROS may be involved in the complex processes and reactions associated with premature aging. Tea and polyphenols may be an inexpensive pleasant part of nutrition and lifestyle to extend a life in good health.

Tea polyphenols have been found to interfere with the metabolism of harmful compounds such as carcinogens and detoxify them through the induction of phase II enzymes, such as glucuronosyl transferases. The tea polyphenols in addition have the important and interesting properties of inhibiting cell growth, not of normal cells, but of neoplastic and preneoplastic cells. This plays a role in the lower incidence of many types of cancer in tea drinkers, but we can speculate that tea might eventually find a role in therapy. Actually, tea should be main beverage served in hospitals, recovery facilities and senior citizens or nursing homes.

Tea also is beneficial in lowering the growth of intestinal bacteria that are not good for the organism but favor the growth of beneficial organism in the gut. Thus, tea drinkers have a healthier intestinal flora, which can be construed to be an important metabolic organ.

How much tea might one consume? Most research shows that 5-10 cups of tea daily might be optimal, with a concentration for about 2 percent of tea, green or black. Recently, because of the problem of obesity in the Western World, and of growing importance elsewhere as people adopt Western dietary habits, some research has shown that green tea increases the metabolic rate of the body, and therefore, helps control body weight. This has not yet been demonstrated for black tea.

Lastly, the tea leaf and thus, tea contains some caffeine, much less than is present in other beverages, about 40-50 ml caffeine per 130 ml cup compared to 132-150 ml in a cup of coffee, or 80-90 mg in the so called soft drinks. Caffeine has no real adverse affects, but it is a stimulant, working perhaps together with the tea polyphenols. It can be construed to be beneficial, but those individuals extremely sensitive to the stimulant effect, decaffeinated teas are available and they might be consumed by such individuals in the afternoon and evening. By the way, the health promoting benefits of tea are not fully dependent on caffeine, so that one can recommend the use of decaffeinated tea by children ages 6-15.

This issue of the International Journal of Tea Science includes important contributions by Drs. Hasan Mukhtar et al., Yukihiko Hara, Tadakazu Takeo; Maqsood Siddiqi et al.; Yogeshwar Shukla & Annu Arora; Tirtham P. Rao et al. and P. Pushpangadan & P.G. Latha. This collection of papers serves to inform the international readership of the value of extending intake of tea by the World's populations, as an inexpensive means to foster public health worldwide. Therapy of chronic diseases is costly and often not very effective. In contrast, approaches to disease prevention minimize the expenses of medical care. The beverage tea, and the use of concentrated forms as capsules of the polyphenols provide a pleasant approach to staying healthy to a ripe old age.

New York March 6, 2003 **John H. Weisburger, PhD, MD (hc)**