

# CURRENT ISSUES

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### The Pleasures of Eating: Could Chocolate, Green Tea and Red Wine Actually Be Good for Us?

#### Introduction

For human beings, eating goes beyond the mere act of meeting our physiologic needs. In sharp contrast to animals, humans eat, rather than feed, and choose foods not only for sustenance, but also for pleasure and comfort (1).

For more than a decade, media reports have captivated the public with the promise that pleasurable foods such as chocolate, and red wine offer health benefits. By linking taste with health, these reports have impacted food selection, sometimes very significantly. For example, a November 1991, broadcast of the American television news magazine, *60 Minutes* that focused on the so-called "French Paradox" led to an immediate and profound increase in red wine consumption (2). Within four weeks, U.S. sales of red wine increased by 44 percent (2).

Recent reports in the media suggesting that foods and beverages such as chocolate, red wine and, more recently, green tea are health-promoting have led to confusion amongst both consumers and health professionals. To many people, the notion that these indulgence foods might be healthful seems far-fetched, or at least over-stated. However, scientific studies have documented results that suggest that these very tasty foods and beverages may positively impact health.

#### Is Chocolate a Health Food?

Chocolate is often cited as a favourite food and the notion that chocolate could promote health is intriguing to many "chocoholics."

Chocolate is a complex food that contains several bioactive constituents. Chocolate – particularly dark chocolate and cocoa powder - is a rich source of a key subclass of oligomeric flavonoids known as procyanidins (3-6). Chocolate is created by combining a number of different ingredients and the actual process used to create a finished chocolate product significantly influences the cocoa and procyanidin content. The inclusion of greater

amount of cocoa in dark chocolate results in flavanoid concentrations that are double that found in milk chocolate. White chocolate is prepared without any cocoa solids and therefore contains no cocoa-based flavanoids. The flavonoids in chocolate exert anti-oxidant effects and, as a result, have been linked to reductions in disease risk. Chocolate and chocolate products such as cocoa powder have been shown to exhibit antioxidant abilities that exceed that of many other flavanol-rich foods, such as green tea, red wine, and garlic (6).

Longitudinal data are lacking and, as a result, it is not possible to quantify the impact of chocolate intake on health or chronic disease risk-reduction. However, studies on the procyanidins and other flavanoids found in chocolate have demonstrated antioxidant effects in humans. These data offer support for a link between consumption of chocolate – particularly dark chocolate - and CVD risk reduction (3,6,7). Working with human subjects, Kondo and colleagues observed an inhibition of LDL cholesterol oxidation within 2 h after the consumption of a flavanol-rich cocoa product (8). Similarly, the consumption of dark (flavonoid-rich) chocolate has also been found to increase plasma antioxidant capacity in a dose-dependent manner (9). To date, the mechanism of action that underpins the antioxidant effects of flavanols has not been fully elucidated.

Flavonoids can be subdivided into 13 different classes based on chemical structure. Flavanols – which are abundant in chocolate - are one of these sub-classes. The flavanols in chocolate offer additional cardiovascular benefits that are independent of their anti-oxidant qualities. Flavanols have been shown to exert positive influences on inflammation, platelet aggregation, and endothelial changes that are related to vascular function (10-12). These phytochemicals appear to influence the cardiovascular system by enhancing vascular function and decreasing platelet aggregation, which, in turn, could reduce the risk for CVD, hypertension and stroke. Several, short-term, in vivo studies in humans provide support for the hypothesis that the consumption of flavanol-rich foods like chocolate is associated with reduced risk for vascular disease (6, 10-13). However, longer-term data on the effects of cocoa-based polyphenolic compounds is lacking and more research is

# CURRENT ISSUES

## THE INSIDE STORY

JULY 2006

CURRENT ISSUES

DIETITIANS OF CANADA

needed to quantify the ultimate impact of chocolate on CVD.

In addition to its potential heart health effects, chocolate has been purported to positively impact mood (14,15). This effect has been linked to the presence of phenylethylamine (PEA) in chocolate. PEA is an endogenous neuroamine that enhances attention span and other cognitive functions in humans and animals. In the brain, PEA acts in a similar manner to amphetamine, an effect that would seem to support its role in enhancing mood (14). However, this relationship is not as straightforward as it might seem and is confounded by the fact that the level of PEA found in chocolate is several orders of magnitude less than that shown to exert a pharmacological effect on mood or behaviour in humans (14).

The mechanism for the euphoric effect of chocolate on mood has yet to be defined and research in this area continues. Some have speculated that it is the carbohydrate or caffeine content of chocolate that is responsible for this effect (14). It has also been suggested that the perceived impact of chocolate on mood is a learned experience or coping mechanism rather than a biophysical one (14, 15).

It is important to bear in mind the importance of moderation when counselling consumers about the potential health benefits of consuming chocolate. While chocolate may offer benefits it can also be a rich source of energy (calories) and fat. Recognizing this reality, it would seem prudent to establish an awareness that you can “get too much of a good thing,” and that the tenants of healthy eating - balance, variety and moderation – should supersede a strong focus on any one food.

### Tea Time?

Tea has long ranked as a favourite Canadian beverage (16). Over the past several years, however, tea has shifted from its position as a comforting beverage to a health promoting drink. This is especially true for green tea, which has seen a rapid rise in consumption in recent years (17).

All teas are derived from the leaves and buds of the *Camellia sinensis* plant (18). Tea is loosely classified into one of three types: black, green and oolong depending on the level of processing the leaves and buds undergo. Typically tealeaves are harvested, and then withered, rolled out, fermented or oxidized and finally mechanically

dried. Fermentation is the critical processing step that impacts the final product. During this process, the leaves are spread on a cement, glass or tile floor, and allowed to rest and turn colour. A short fermentation results in a pungent tea such as a green tea while a longer one produces a tea with a fuller flavour such as black tea.

Like chocolate, tea is chemically complex and contains a wide variety of bioactive constituents, including polyphenols. The fermentation process influences the ultimate concentration of polyphenols in tea. For example, white and green teas – which undergo minimal fermentation – contain relatively larger concentrations of polyphenolic compounds than more heavily fermented black teas (18).

The health benefits that have been linked to tea are attributed to these polyphenolic compounds and in particular to a subclass of polyphenols known as catechins. Catechins have demonstrated antioxidant properties, which, in turn, have led to speculation that tea – and in particular, green tea - could aid in the prevention and treatment of diseases and conditions that are routed in metabolic oxidation such as cancer, and CVD (19).

Green tea is also purported to play a role in cancer risk reduction. Studies in animal models have demonstrated a preventative effect of green tea in the development of breast, prostate, lung, and skin cancer (20,21). However, corroborative evidence in humans is lacking and the data that are available come largely from epidemiological studies, which produced inconsistent results (21,22).

The reduced incidence of CVD observed in some Asian populations has been attributed to green tea consumption (23). Mean per capital intakes of green tea in Asia are approximately 3 to 4 cups per day and it is hypothesized that the anti-oxidant properties of the polyphenolic compounds present in green tea afford a cardio-protective effect (24). A small amount of data exists to support this assertion. For example, work by Miura et al found that in vivo, oral intake of green tea extract increased resistance of plasma LDL oxidation, which, in turn, would tend to decrease atherogenesis (25). This finding notwithstanding, there is a paucity of data from well-controlled, prospective human trials demonstrating a relationship between green tea and cardiac risk reduction. Additional study is needed to clarify the true relationship, if any, between green tea intake and CVD.

Recently, green tea has been touted as a potential treatment or preventive measure for overweight and obesity. Preliminary work in animal models by Kao et. al. showed that feeding purified epigallocatechin gallate

# CURRENT ISSUES

## THE INSIDE STORY

(EGCg) – one of the catechins found in green tea - prevented increases in body weight in lean and obese rats (26). This work has yet to be replicated in humans and, to date, there is not compelling evidence to support the notion that green tea, independent of other factors, can produce desirable changes in body weight or composition.

Research is ongoing into the effects of green tea and its active constituents on human health. And while green tea is not associated with any health risks outside of the established impact of tannins on iron bioavailability, there is limited evidence to support recommendations to increase consumption of this beverage (27,28).

### Red Wine: A Toast to Good Health?

The health promoting effects of red wine have been of interest to the public for some time. Recognition of the so-called "French Paradox," in the early 1990's initially underpinned this interest. The 'French paradox' refers to the very low incidence of and mortality rates from CVD in France despite the fact that saturated fat intakes, serum cholesterol, blood pressure and prevalence of smoking are similar to those observed in other Western industrialized nations. (29). The reduced risk of CVD observed in the French has been attributed to their higher alcohol consumption and to their intake of antioxidant vitamins, both of which are related to wine consumption (29).

Given its composition, it is conceivable that red wine could exert positive effects on health. Red wine is rich in compounds such as resveratrol, quercetin and catechin that have been shown to function as antioxidants (30). In vitro, ex vivo and in vivo experiments of resveratrol in animal models have demonstrated a range of biological activities, including anti-oxidant and anti-inflammatory properties, related to heart health (30,31). Specifically, in animal models, resveratrol has been shown to interfere with macrophage function, cells that are understood to play a central role in chronic inflammation (30,31). Inflammation is a contributor to atherosclerosis or the build up of fatty deposits in the lining of arteries.

Compelling data to support a role for red wine in human heart health is still lacking. As is the case with chocolate, moderation matters with respect to red wine consumption. Consumers need to be aware of the concrete risks of excessive alcohol intake and reminded of the importance of limiting alcohol intake to one drink per day for women

to two drinks per day for men as suggested in *Canada's Food Guide to Healthy Eating*.

### Dietitian Practice Points

- Although it is captivating to think that savouring a chocolate truffle, indulging in a glass of cabernet or sipping green tea throughout the day could offer substantial health benefits, the available data do not yet support these assertions.
- The study of bioactive constituents in foods is in its infancy.
- Additional research is needed to fully qualify and quantify the complex relationships that may exist between chocolate, green tea, red wine and health.

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# CURRENT ISSUES

## THE INSIDE STORY

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