Coffee consumption and risk of type 2 diabetes, cardiovascular diseases and cancer

Numerous epidemiological studies have evaluated the association between coffee consumption and risk of type 2 diabetes, coronary heart disease and various cancers. The scientist at Department of Nutrition, Harvard Medical School, Boston, USA briefly reviewed the evidence for a relation between coffee consumption and these conditions, with particular attention to methodological issues. Several early studies suggested that coffee consumption could result in a marked increase in risk of coronary heart disease and several types of cancer. However, more recent prospective cohort studies that are less prone to selection and information bias have not confirmed these findings. High consumption of unfiltered types of coffee, such as French press and boiled coffee has been shown to increase low-density-lipoprotein-cholesterol concentrations. In addition, limiting caffeinated coffee intake during pregnancy seems a prudent choice. However, evidence has been accumulating that frequent consumption of coffee may reduce risk of type 2 diabetes and liver cancer. Further experimental studies are warranted to elucidate the underlying mechanisms and possibly identify the components in coffee that are responsible for these putative effects. To summarize the currently available evidence on coffee and risk of cardiovascular diseases and cancer is largely reassuring and suggests that, for the general population, addressing other health-related behaviours has priority for the prevention of chronic diseases [van Dam Rob M, Coffee consumption and risk of type 2 diabetes, cardiovascular diseases and cancer, Appl Physiol Nutr Metab, 2008, 33(6), 1269-1283].

Colour of orange juice treated by High Intensity Pulsed Electric Fields

Citrus juices are highly consumed in many countries and now-a-days, consumers desire high quality foods, with freshly flavour, texture and colour, with minimal or no chemical preservatives, and above all safe. High Intensity Pulsed Electric Field (HIPEF) is one of the non-thermal minimal processing technologies for alternative (preservation) process for liquid food. Thus, scientists from Spain evaluated the effect on colour, browning and hydroxymethylfurfural (HMF) of a pasteurized orange juice and the same orange juice treated by HIPEF, during 7 weeks stored in refrigeration at 2°C and 10°C. Pasteurized orange juice presents greater yellow tendency ($b'$) and less red tendency ($a'$) than the untreated orange juice, while HIPEF orange juice presents a coloration more similar to the untreated orange juice. Colour variations ($\Delta E$) during storage are greater in orange juice pasteurized than in HIPEF treated orange juice. Non-thermal treated orange juice has less non-enzymatic browning than the pasteurized one. There is a significant increase in this parameter from the fourth week of storage in all the juices stored at 10°C, while in the ones stored at 2°C the browning index values are maintained during more time. There are no significant variations in the HMF content of the juices pasteurized or treated by HIPEF respect the untreated orange juice. During refrigerated storage, HMF is always below the maximum values established [Cortés Clara, Esteve María J and Frígola Ana, Color of orange juice treated by High Intensity Pulsed Electric Fields during refrigerated storage and comparison with pasteurized juice, Food Control, 2008, 19 (2), 151-158].
Beverage

The influence of storage time on micronutrients in bottled tomato pulp

Tomato is one of the most extensively marketed vegetable foods; its processed forms include pulp, purée, sauce, juice, paste and peeled whole tomato. It is an important source of carotenoids, organic acids and phenolics. The bioavailability of the nutrient content of tomato products depends on the processing that they have undergone and on the duration and conditions of storage. The researchers at Spain and Columbia determined micronutrients in bottled tomato pulp stored at room temperature (20.0±1.8°C) for 0, 60, 120 and 180 days. After 180 days, lycopene content had undergone no significant change (P>0.05); ascorbic, malic and citric acid levels had fallen significantly (P<0.001); and there were significant increases in β-carotene level (P<0.001) and total phenolics concentration (P<0.01). The fall in organic acid levels correlated well with the increase in 5-hydroxymethyl-2-furfural (HMF) (r²>0.80). In conclusion, in this study, the lycopene content of bottled tomato pulp remained stable during 180 days’ storage; β-carotene and total phenolics concentrations rose significantly, while the concentrations of malic, ascorbic and citric acids all underwent significant reductions that correlated well with an increase in HMF concentration [Ordóñez-Santos Luis Eduardo, Vázquez-Odériz Lourdes, Arbones-Maciñeira Enrique and Romero-Rodríguez M Ángeles, The influence of storage time on micronutrients in bottled tomato pulp, Food Chem, 2009, 112 (1), 146-149].

Does caffeine alter muscle carbohydrate and fat metabolism during exercise?

Caffeine, an adenosine receptor antagonist, has been studied for decades as a putative ergogenic aid. In the past 2 decades, the information has overwhelmingly demonstrated that it indeed is a powerful ergogenic aid and frequently theories have been proposed that this is due to alterations in fat and carbohydrate metabolism. While caffeine certainly mobilizes fatty acids from adipose tissue, rarely have measures of the respiratory exchange ratio indicated an increase in fat oxidation. However, this is a difficult measure to perform accurately during exercise and small changes could be physiologically important. The few studies examining human muscle metabolism directly have also supported the fact that there is no change in fat or carbohydrate metabolism, but these usually have had a small sample size. The scientists at Canada combined the data from muscle biopsy analyses of several similar studies to generate a sample size of 16-44, depending on the measure. They examined muscle glycogen, citrate, acetyl-CoA, glucose-6-phosphate and cyclic adenosine monophosphate (cAMP) in resting samples and in those obtained after 10-15min of exercise at 70-85% maximal oxygen consumption. Exercise decreased (P<0.05) glycogen and increased (P<0.05) citrate, acetyl-CoA, and glucose-6-phosphate. The only effects of caffeine were to increase (P<0.05) citrate in resting muscle and cAMP in exercise. There is very little evidence to support the hypothesis that caffeine has ergogenic effects as a result of enhanced fat oxidation. Individuals may, however, respond differently to the effects of caffeine and there is growing evidence that this could be explained by common genetic variations [Terry E, Battram Danielle S, Dela Flemming, Ahmed El-Sohemy and Farah SL Thong, Does caffeine alter muscle carbohydrate and fat metabolism during exercise?, Appl Physiol Nutr Metab, 2008, 33(6), 1311-1318].
Caffeine and sports performance

Athletes are among the groups of people who are interested in the effects of caffeine on endurance and exercise capacity. Although many studies have been performed to investigate the effect of caffeine ingestion on exercise, not all are suited to draw conclusions regarding caffeine and sports performance. Characteristics of studies that can better explore the issues of athletes include the use of well-trained subjects, conditions that reflect actual practices in sport and exercise protocols that simulate real-life events. There is a scarcity of field-based studies and investigations involving elite performers. Researchers are encouraged to use statistical analyses that consider the magnitude of changes and to establish whether these are meaningful to the outcome of sport. The scientist at Department of Sports Nutrition, Australian Institute of Sport, Canberra, Australia observed that available literature which follows such guidelines suggests that performance benefits can be seen with moderate amounts (~3mg/kg body mass) of caffeine. Furthermore, these benefits are likely to occur across a range of sports, including endurance events, stop-and-go events (e.g., team and racquet sports) and sports involving sustained high-intensity activity lasting from 1-60min (e.g., swimming, rowing, and middle and distance running races). The direct effects on single events involving strength and power, such as lifts, throws and sprints, are unclear. Further studies are needed to better elucidate the range of protocols (timing and amount of doses) that produce benefits and the range of sports to which these may apply. Individual responses, the politics of sport and the effects of caffeine on other goals, such as sleep, hydration and refuelling, also need to be considered [Burke Louise M, Caffeine and sports performance, *Appl Physiol Nutr Metab*, 33(6), 1319-1334].

Effect of caffeine on the neuromuscular system

The ergogenic effect of caffeine on endurance exercise performance is multifactorial, however, scientists at Canada found that there is evidence for an effect on both the central nervous system and the excitation-contraction coupling of skeletal muscle. The increase in exercise performance seen following intracerebroventrical caffeine injection in rats provides strong evidence for a central ergogenic effect. The central ergogenic effect is not likely related to the ability of caffeine to promote wakefulness, but could be due to an increase in the pain and effort perception threshold. There is no evidence that caffeine alters peripheral nerve conduction velocity or neuromuscular transmission and one study showed that motor unit synchronization was not altered by caffeine. Studies have also shown that caffeine can have a direct effect on skeletal muscle that could be ergogenic. For example, patients with high cervical spinal cord lesions showed improvements in stimulated contractile force during cycling, in spite of the fact that they have no peripheral pain input and no sympathetic nervous system response. Two studies have found a potentiation of force production during submaximal stimulation intensities and one found that the M-wave amplitude was not altered by caffeine. Together, these studies suggest that caffeine can enhance contractile force during submaximal contractions by potentiating calcium release from the ryanodine receptor, not by altering sarcoplasmic excitability. Furthermore, the potentiation of force during submaximal electrical stimulation is identical in habitual and nonhabitual caffeine consumers. Thus, the ergogenic effects of caffeine during endurance activity are mediated partly by enhanced contractile force and partly by a reduction in perceived exertion, possibly though a blunting of effort and (or) pain [Tarnopolsky Mark A, Effect of caffeine on the neuromuscular system—potential as an ergogenic aid, *Appl Physiol Nutr Metab*, 2008, 33(6), 1284-1289].
Survival of *Staphylococcus aureus* or *Listeria innocua* on two types of surfaces: Polypropylene and stainless steel in contact with dairy products

*Listeria monocytogenes*, *Staphylococcus aureus* and *Escherichia coli* O157:H7 are pathogens of major concern for the dairy industry. The survival of *Listeria innocua* and *Staphylococcus aureus* on two types of surface: polypropylene and stainless steel were investigated after contamination with milk products (raw milk, pasteurized skim milk and cheese curd) by scientists at France. Sheets were incubated at 12°C or 25°C during 8 days. The survival and growth of the two strains were possible but different according to milk origins, temperature and surface. *L. innocua* attached to stainless steel in cheese curd reached approximately 3.6±0.2LogCFU cm⁻² at 12°C but was not detected at 25°C after 8 days. The result was different on polypropylene with 3.0±0.5LogCFU cm⁻² in cheese curd at 25°C. *S. aureus* growth is more limited by cheese curd than *L. innocua* on the two surfaces at the two temperatures tested.

In conclusion, it appeared that *L. innocua* and *S. aureus* adhered on different abiotic surfaces, which can be encountered in food factories and were able to accumulate on these surfaces after 8 days. These findings point to biofilm formation as an important factor in the survival of *L. innocua* (used as a surrogate for *L. monocytogenes*) and *S. aureus* in food-processing environments. The survival of bacteria was significantly affected by the food matrix (soiling agent) in which the organism is embedded and temperatures of fouling. Contamination of foods can occur during any stage of the manufacturing or processing phase. Further studies will also be necessary to understand the mechanisms underlying different rates of biofilm growth among strains of *L. monocytogenes*. Knowledge gained in these areas will be an important step towards prevention of biofilms and elimination of persistent strains from food-processing environments [Oulahal Nadia, Brice Wilfried, Martial Adèle and Degraeve Pascal, Quantitative analysis of survival of *Staphylococcus aureus* or *Listeria innocua* on two types of surfaces: Polypropylene and stainless steel in contact with dairy products, *Food Control*, 2008, 19 (2), 178-185].

---

Potential role of green tea catechins in the prevention of the metabolic syndrome

The metabolic syndrome (MetS) represents an emerging health burden for governments and health care providers. Particularly relevant for prevention and early management of MetS are lifestyle conditions including physical activity and the diet. It has been shown that green tea, when consumed on a daily basis, supports health. Many of the beneficial effects of green tea are related to its catechin, particularly (-)-epigallocatechin-3-gallate (EGCG) content. There is conclusive evidence from *in vitro* and animal studies which provide the concepts for underlying functional mechanisms of green tea catechins and their biological actions. An increasing number of human studies have explored the effects of green tea catechins on the major MetS conditions such as obesity, type-2 diabetes and cardiovascular risk factors. The scientists at Switzerland and Germany published a comprehensive overview of the human studies addressing the potential benefits of green tea catechins on the MetS.

The number of human studies in this field is still limited. However, the majority of human epidemiological and intervention studies demonstrate beneficial effects of green tea or green tea extracts, rich in EGCG on weight management, glucose control and cardiovascular risk factors. The optimal dose has not yet been established. The current body of evidence in humans warrants further attention. In particular, well-controlled long-term human studies would help to fully understand the protective effects of green tea catechins on parameters related to the MetS [Thielecke Frank and Boschmann Michael, The potential role of green tea catechins in the prevention of the metabolic syndrome – A review, *Phytochemistry*, 2009, 70(1), 11-24].
Chocolate milk consumption in comparison to commercially available sport drinks

The scientists at UK examined the effects of 3 recovery drinks on endurance performance following glycogen-depleting exercise. Nine trained male cyclists performed 3 experimental trials, in a randomized counter-balanced order, consisting of a glycogen-depleting trial, a 4-h recovery period and a cycle to exhaustion at 70% power at maximal oxygen uptake. At 0 and 2h into the recovery period, participants consumed chocolate milk (CM), a carbohydrate replacement drink (CR), or a fluid replacement drink (FR). Participants cycled 51% and 43% longer after ingesting CM (32±11min) than after ingesting CR (21±8min) or FR (23±8min). CM is an effective recovery aid after prolonged endurance exercise for subsequent exercise at low-moderate intensities [Thomas Kevin, Morris Penelope and Stevenson Emma, Improved endurance capacity following chocolate milk consumption compared with 2 commercially available sport drinks, Appl Physiol Nutr Metab, 2009, 34 (1), 78-82].

Chitosan influence on glucose and calcium availability from yoghurt

Since chitosan complies with the definition of dietary fibre it is necessary to study the interaction of this biopolymer with nutrients. Yoghurt with fortified chitosan and different types of plants fibres like wheat, bamboo, apple, psyllium and inulin was used as a food model by researchers of Argentina. The availabilities of glucose and calcium in this model were studied by an in vitro gastrointestinal tract simulation. Results showed that the different fibres decreased both glucose and calcium availabilities whereas the effect of chitosan was more pronounced (17.7±2.1% and 21.0±2.5% depress, respectively). This work demonstrated that the addition of chitosan to yoghurts influences the availability of nutrients [Rodríguez María Susana, Montero Mirta, Staffolo Marina Dello, Martino Miriam, Bevilacqua Alicia and Albertengo Liliana, Chitosan influence on glucose and calcium availability from yogurt. In vitro comparative study with plants fibre, Carbohydr Polym, 2008, 74 (4), 797-801].

Anthocyanin and colour degradation in ozone treated blackberry juice

Blackberries (Rubus fruticosus Linn.) are used in various food products such as juice, ice cream, jams and for nutraceutical applications. Juices produced from blackberries are rich in various antioxidants including anthocyanins. Researchers at Ireland and USA carried out studies to investigate the effects of ozone concentration and treatment time on the anthocyanin content and colour of blackberry juice and to model the degradation kinetics using response surface methodology (RSM). RSM methodology based on a two factor five level central composite design was employed with control variables of ozone concentration (0 to 7.8%w/w) and treatment time (0 to 10min) at a constant gas flow rate. Predicted models were found to be significant (P<0.001) with regression coefficients ($R^2$) of 0.89, 0.82, 0.95, 0.86 and 0.97 for L, a, b, TCD and anthocyanin content, respectively. Ozone concentration and treatment time were found to be critical factors influencing both anthocyanin and colour degradation. The study demonstrated that response surface methodology can be employed to model colour and anthocyanin degradation of ozonated blackberry juice while minimizing the number of experiments required. The work demonstrates that ozonation results in the significant degradation (>90%) of anthocyanins and colour in blackberry juice. The effects of ozonation on an important health promoting compound (anthocyanins) and a key quality parameter (colour) of fruit juices should be considered by processors prior to the adoption of this preservation technology [Tiwari BK, O’Donnell CP, Muthukumarappan K and Cullen PJ, Anthocyanin and colour degradation in ozone treated blackberry juice, Innov Food Sci Emerg Technol, 2009, 10 (1), 70-75].

The scientists at UK examined the effects of 3 recovery drinks on endurance performance following glycogen-depleting exercise. Nine trained male cyclists performed 3 experimental trials, in a randomized counter-balanced order, consisting of a glycogen-depleting trial, a 4-h recovery period and a cycle to exhaustion at 70% power at maximal oxygen uptake. At 0 and 2h into the recovery period, participants consumed chocolate milk (CM), a carbohydrate replacement drink (CR), or a fluid replacement drink (FR). Participants cycled 51% and 43% longer after ingesting CM (32±11min) than after ingesting CR (21±8min) or FR (23±8min). CM is an effective recovery aid after prolonged endurance exercise for subsequent exercise at low-moderate intensities [Thomas Kevin, Morris Penelope and Stevenson Emma, Improved endurance capacity following chocolate milk consumption compared with 2 commercially available sport drinks, Appl Physiol Nutr Metab, 2009, 34 (1), 78-82].

Chitosan influence on glucose and calcium availability from yoghurt

Since chitosan complies with the definition of dietary fibre it is necessary to study the interaction of this biopolymer with nutrients. Yoghurt with fortified chitosan and different types of plants fibres like wheat, bamboo, apple, psyllium and inulin was used as a food model by researchers of Argentina. The availabilities of glucose and calcium in this model were studied by an in vitro gastrointestinal tract simulation. Results showed that the different fibres decreased both glucose and calcium availabilities whereas the effect of chitosan was more pronounced (17.7±2.1% and 21.0±2.5% depress, respectively). This work demonstrated that the addition of chitosan to yoghurts influences the availability of nutrients [Rodríguez María Susana, Montero Mirta, Staffolo Marina Dello, Martino Miriam, Bevilacqua Alicia and Albertengo Liliana, Chitosan influence on glucose and calcium availability from yogurt. In vitro comparative study with plants fibre, Carbohydr Polym, 2008, 74 (4), 797-801].

Anthocyanin and colour degradation in ozone treated blackberry juice

Blackberries (Rubus fruticosus Linn.) are used in various food products such as juice, ice cream, jams and for nutraceutical applications. Juices produced from blackberries are rich in various antioxidants including anthocyanins. Researchers at Ireland and USA carried out studies to investigate the effects of ozone concentration and treatment time on the anthocyanin content and colour of blackberry juice and to model the degradation kinetics using response surface methodology (RSM). RSM methodology based on a two factor five level central composite design was employed with control variables of ozone concentration (0 to 7.8%w/w) and treatment time (0 to 10min) at a constant gas flow rate. Predicted models were found to be significant (P<0.001) with regression coefficients ($R^2$) of 0.89, 0.82, 0.95, 0.86 and 0.97 for L, a, b, TCD and anthocyanin content, respectively. Ozone concentration and treatment time were found to be critical factors influencing both anthocyanin and colour degradation. The study demonstrated that response surface methodology can be employed to model colour and anthocyanin degradation of ozonated blackberry juice while minimizing the number of experiments required. The work demonstrates that ozonation results in the significant degradation (>90%) of anthocyanins and colour in blackberry juice. The effects of ozonation on an important health promoting compound (anthocyanins) and a key quality parameter (colour) of fruit juices should be considered by processors prior to the adoption of this preservation technology [Tiwari BK, O’Donnell CP, Muthukumarappan K and Cullen PJ, Anthocyanin and colour degradation in ozone treated blackberry juice, Innov Food Sci Emerg Technol, 2009, 10 (1), 70-75].
Beverage

Improving the stability of lycopene Z-isomers in isomerised tomato extracts

Lycopene is the predominant carotenoid found in tomatoes and is the pigment responsible for the red colour of ripe tomato fruit and tomato products. Tomato-based foods rich in Z-lycopene are potentially more bioavailable and have greater bioefficacy compared to natural tomato products which mainly contain all-\(E\)-lycopene. To prepare a stable tomato extract with a high level of Z-lycopene, geometrical isomerisation of lycopene was studied by researchers at Switzerland and Italy in organic solvents either alone or in the presence of a tomato extract. Interconversion between the isomers was observed in all systems with 13Z-lycopene being the least stable. Heating a tomato extract containing mainly the all-\(E\)-isomer in ethyl acetate produced successively 13Z-, 9Z- and 5Z-lycopene. An isomerised tomato oleoresin with a minimal content of the most unstable 13Z-lycopene could be obtained by refluxing tomato oleoresin in ethyl acetate for one week. In this isomerised tomato oleoresin, total lycopene and lycopene isomer profiles were shown to remain constant for one year at room temperature. Accordingly, this product is a valid source of stable and potentially highly bioavailable lycopene [Lambelet Pierre, Richelle Myriam, Bortlik Karlheinz, Franceschi Federico and Giori Andrea M, Improving the stability of lycopene Z-isomers in isomerised tomato extracts, Food Chem, 2009, 112 (1), 156-161].

Changes in some components of soymilk during fermentation with *Ganoderma lucidum*

Soymilk was fermented with the basidiomycete, *Ganoderma lucidum* WZ02 and the changes in the contents of polysaccharide, sugars, crude protein, B-vitamins, free amino acids and isoflavones were analyzed by researchers at PR China. Polysaccharide and crude protein were increased by the fermentation of *G. lucidum* while most free amino acids were reduced. The flatulence factor (e.g., stachyose and raffinose) was significantly decreased and stachyose was not detected after 72 h of fermentation. The contents of thiamin, riboflavin and niacin were increased during the fermentation. Most of isoflavone glycosides were converted to aglycones and the contents of daidzein and genistein were increased by the fermentation of *G. lucidum*. The results suggested that fermentation by *G. lucidum* could improve the acceptability and health properties of soymilk [Yang Hailong and Zhang Liang, Changes in some components of soymilk during fermentation with the basidiomycete *Ganoderma lucidum*, Food Chem, 2009, 112 (1), 1-5].

A traditional Turkish lactic acid fermented beverage: *Shalgam*

*Shalgam* is a traditional lactic acid fermented beverage in which black carrot, bulgur flour, sourdough, salt, turnip and water are used for production. It is a red coloured, cloudy and sour soft drink mainly consumed in southern Turkey, however, its consumption is currently increasing in other parts, as well. *Shalgam* is produced on an industrial scale. Researchers at Department of Food Engineering, Faculty of Agriculture, Cukurova University, Adana, Turkey reviewed some aspects of *shalgam* production. Although there is no standard production technique in industry, it could be stated that there are two methods for *shalgam* production: the traditional method and the direct method. The traditional method comprises sourdough fermentation and carrot fermentation. In the direct method, however, the sourdough fermentation is omitted and only the carrot fermentation is applied. During fermentation, mainly lactic acid bacteria give *shalgam* its typical taste and flavour by producing lactic acid, ethanol and some other organic compounds [Erten Huseyin, Tanguler Hasan and Canba Ahmet, A traditional Turkish lactic acid fermented beverage: Shalgam (Salgam), Food Rev Int, 2008, 24 (3), 352-359].