# Cup of Tea

**Prof. Jagadish Pai, Executive Director, PFNDAI**

Tea is a beverage prepared by pouring hot water over tea leaves of Camellia sinensis (earlier named Thea sinensis), an evergreen shrub originated in Asia. The plant grows best at a fairly high altitude in a warm climate with abundant rainfall. Tea originated in China as a medicinal drink. It is distinctly a tropical plant and its plantations are often found in mountainous areas bordering equator.

Tea plant will grow into a tree if left undisturbed, but is pruned to waist height for ease of plucking. Short plants grow more new shoots providing new tender leaves for better quality of tea. In 2003, global tea production was 3.21 million tonnes while it reached over 4.52 million tonnes in 2010. As per FAO the world production in 2012 was over 4.8 million tonnes. Global Industry Analysts (GIA) predict the production to reach 10.57 million tons with value of about 70 billion US dollars. ITC Annual Bulletin Supplement gave global tea production in 2012 to be over 4.5 million tonnes (MT) of which China produced 1.76 MT, India 1.1 MT, Kenya 0.369 MT, Sri Lanka 0.326 MT and Vietnam, Turkey and Indonesia were among other major producers. Of the production Sri Lanka and Kenya exported most of their production while China and India consumed domestically most while exported a small portion.

**Types of Tea**

The first written reference of tea made and consumed are about fourth century A.D. in China where tea was described as “a beverage made from boiled leaves”. During this time tea was made of leaves boiled in water with ginger, orange and other materials added to it. Tea was consumed for medicinal purposes to treat digestive and nervous conditions. Tea cultivation started in India around 1770s by British using tea seeds from China which did not give good results. Around 1820s wild tea plants growing in Brahmaputra valley were used to produce first Indian tea from Assam. There are three major areas growing tea in India, Darjeeling, Assam and Nilgiri, but several regions in Kerala, Karnataka, Himachal Pradesh, Uttaranchal, Sikkim, Orissa, Bihar, and north-east states are now producing tea.

Tea from green tea leaves generally fall into two main types because of processing namely Black Tea and Green Tea. Fermentation process is arrested in making green tea while it is continued in black tea. Further processing differences give rise to more variants so Green Tea is unwilted and unoxidised (not fermented), White Tea is wilted and unoxidised, Yellow tea is unwilted, unoxidised but allowed to yellow, Oolong Tea is wilted, bruised, and partially oxidised and Black Tea is wilted, sometimes crushed and fully oxidised (fermented). Green Tea may also be partially oxidised. Thus there are five major steps in processing of tea which distinguishes different types of tea: 1. withering or wilting, 2. rolling, crushing or disruption, 3. fermentation or oxidation, 4. drying or firing and 5. sorting & grading.

**Processing of Tea**

Only a terminal bud and two young leaves are plucked from the tea bush once early spring and then early summer. Autumn or winter plucking is less common depending on the climate. Machine plucking gives more broken leaves and lesser quality.

Withering or wilting: Tea leaves start wilting soon after picking with onset of enzymatic oxidation. Wilting or withering differs in different regions but leaves are usually wilted on racks for almost a day. Wilting removes moisture from leaves. Leaves can be put under sun or in a cool airy place to remove moisture losing over a fourth of their weight in the process. It also promotes some breakdown of proteins and liberates caffeine. These processes alter the taste of tea.

Rolling: Also called disruption or maceration, in this tea leaves are bruised or torn to promote oxidation. Earlier process of shaking and tossing in a bamboo tray or basket would lightly bruise leaves. Greater disruption can be done by rollers by kneading and crushing. This process breaks up the leaf structure and releases juices allowing enzymatic reactions and oxidation referred to as fermentation.

Fermentation or Oxidation: Leaves are spread under controlled humidity and allowed oxidation sometimes with mixing. Various chemical and biochemical changes take place like chlorophyll breaks down, tannins are released and transformed. Different degree of oxidation due to different environmental conditions of heat and humidity as well as length of process will determine colour, taste and aroma of leaves. Light oolong may have less than 40% oxidation while darker oolong 60-70% and black tea about 100% oxidation.

Firing: The fermented tea leaves may be fired or heated to stop the reaction and dry it further to make the final product. Drying may be done in sun or with heat on a pan or an oven. Care must be taken not to use excessive heat for too long as it might lose delicate tea aroma.

Green tea is not allowed any oxidation or reaction and even the chlorophyll does not break down. Yellow tea is allowed reactions just enough to break down green colour of chlorophyll and then it is stopped so the yellow colour and mild flavour is obtained. Oolong and black tea look darker because of various reactions which develop stronger flavour and colour. White tea is produced from young leaves and buds which are protected from sun preventing green colour formation due to chlorophyll and are processed in a short time to dry them.

Black tea is made from leaves that are completely oxidised after withering and rolling. Oxidation occurs over 1 to 3 hours and is carried out at 20-30$^{o}$C converting most of catechins into complex tannins. CTC teas use cut, tear, and curl processing during rolling or disruption. Black tea contains much more caffeine.

**Drinking Tea**

Tea is the most popular drink consumed in the world, equalling combined consumption of coffee, chocolate, soft drinks and alcohol. In India, tea is the most popular hot beverage consumed daily in most homes. It is offered to guests both in homes and offices. It is commonly made with addition of milk and sugar and often with spices. Biscuits are often dipped in tea and eaten while drinking tea.

In the UK, it is consumed daily by most and is considered Britain's cultural beverage. It is consumed in homes and in cafes. Afternoon tea with cakes is common in tea-houses. Tea is consumed very commonly in most Asian and many European countries. It is consumed in US too but not as much as coffee and mostly as iced tea with a slice of lemon.

Traditionally tea is prepared by placing tea leaves in a pot or cup and pouring freshly boiled water over the leaves and allow it to brew. After a few minutes the leaves are removed by strainer. Tannins present in the tea will give bitterness or astringency. These are enhanced in tea leaves by oxidation with green tea having the least. Green teas are brewed at lesser temperature compared to black tea to extract their complex aromatic phenolic substances.

Tea used to be consumed earlier from tea pot which would have hot water in which tea leaves were added. When one poured tea into cup a strainer would be used. This brew would either be drunk as such or sugar and/or milk would be added as per one's preferences. Even a slice of lemon would be served in hotels with tea. Tea in India is commonly consumed with milk and sugar. Tea is prepared in hotels, restaurants, clubs, tea stalls and every home. There are some tea stalls that would offer several dozens of different types of teas and would specialise in masala chai (spiced tea) with cardamom, ginger and several other spices in different

combinations. Tea drinking in India would be a morning ritual observed by almost all but in different styles e.g. with bun & maska (butter), with glucose or khari biscuit, jam and toast, and many other accompaniments.

**Health Benefits of Tea**

When black tea brew is analysed, it was found to have good amounts of manganese and small amounts of riboflavin, folate, magnesium, potassium and copper with insignificant amounts of carbohydrates, fibre and protein. Caffeine content varies in a cup of tea depending on the length of time of infusion, and the amount of tea used for infusion. A cup of 250 ml tea may contain 30 to 90 mg caffeine depending on type, brand and brewing method.

Tea is composed of polyphenols, alkaloids (caffeine, theophylline and theobromine), amino acids, carbohydrates, proteins, chlorophyll, volatile organic compounds that contribute to aroma, minerals and trace elements. Polyphenols including catechins including epigallocatechin gallate (EGCG) are thought to be responsible for the health benefits attributed to tea, especially green tea. Black tea contains much lower concentrations of catechins than green tea. Extended oxidation in black tea increases thearubigins and theaflavins, two complex polyphenols. Oolong contains a mixture of catechins in polyphenols. Catechins, potent antioxidants are found primarily in green tea and less in black tea are known for beneficial anti-inflammatory and anti-carcinogenic properties. Some of the health benefits of consuming tea are as follows:

**Beat Stress**

Effects of consumption of green and white tea were compared with water in reduction of stress levels in students. Both green and white tea has a stress lowering effect with white tea having greater effect.

**Boosting the Brain**

Studies have been done to suggest that tea may be beneficial in reducing the risk of dementia and even enhancing brain's cognitive functions, particularly the working memory. Green tea appears to boost memory by enhancing functional brain connectivity. A study in University of Basel showed that drinking green tea extract enhances memory performance suggesting it may have important clinical implications for treatment of neuropsychiatric disorders including cognitive impairment. Several studies in the past suggested green tea enhancing cognitive functioning but this study has proposed neural mechanisms for these benefits. It suggests that green tea might increase short-term synaptic plasticity of the brain.

Caffeine in lower amounts has been known to increase alertness and decrease fatigue. However there are also some undesirable effects as well such as increasing blood pressure, reduction of motor movements, insomnia etc. So excessive amounts could be harmful.

**Cardiovascular Health**

Green tea consumption is associated with reduced mortality due to all causes, including cardiovascular disease. The study followed 40,000 Japanese aged between 40 and 79 for over a decade. Those drinking at least 5 cups of green tea per day had significantly lower risk of dying especially from cardiovascular disease. Another study found that drinking 10 cups green tea lowered cholesterol but with 4 cups of less had no effect. Some studies found that black tea consumption may be associated with reduced risk of stroke and a recent study suggested that long term consumption of black tea slightly lowers blood pressure by 1-2 mmHg.

**Decreasing Cancer Risk**

Catechin Concentrations of Green Tea Infusions

| Catechin in Green Tea Infusion | Catechin Concentration (mg/L)* |
|---|---|
| Epigallocatechin-3-gallate (EGCG) | 117–442 |
| Epigallocatechin (EGC) | 203–471 |
| Epicatechin-3-gallate (ECG) | 17–150 |
| Epicatechin (EC) | 25–81 |

The polyphenols in green tea namely EGCG, EGC, ECG & EC and the theaflavins and thearubigins in black teas have antioxidant activities. These chemicals have substantial free radical scavenging activity and may protect cells from DNA damage. Tea polyphenols have been shown to inhibit tumour cell proliferation and induce apoptosis in animal studies. Tea catechins have been shown to inhibit angiogenesis and tumour cell invasiveness. Tea polyphenols also may protect against damage by ultraviolet UV B radiation and may modulate immune system function. Green tea have been shown to activate detoxification enzymes like glutathione S-transferase and quinine reductase, that may protect against tumour development. The precise mechanism by which tea might help prevent cancer has not been established.

**Polyphenols & Diabetes**

Black tea consumption is correlated with low diabetes prevalence. Polyphenols in tea could act as preventive agents and have beneficial effect against lipid and glucose metabolism disorders associated with type II diabetes.

**Other Benefits**

Black tea extracts have shown anti-obesity and hypolipidemic effects in experimental studies inducing weight loss. Gallic acid in tea extract suppressed food intake in animal models. Surveys have reported that black tea reduces the incidence of dental cavities. Tea can be used as a natural cure for periodontal disease. Polyphenols inhibit bacterial growth and infections. Studies have also shown benefits against rheumatoid arthritis

**Adverse Effects**

Excess consumption of teas especially higher consumption of up to 1200 mg ECGC may cause intestinal gas, nausea, heartburn, stomach ache, abdominal pain, dizziness, headache and muscle pain. Caffeine in tea may also cause adverse effects with higher tea consumption however, intakes of 400 mg caffeine per day have not shown adverse effects. Amounts of caffeine may range from 64 to 112mg per about 240 ml in black tea, 29-53 mg in oolong, and 24-39 mg in green tea. Decaffeinated teas contain less than 12 mg caffeine.

In conclusion, tea can be beneficial to health without adding calories in diet, unless one drinks tea with milk and sugar. It is a widely available and inexpensive beverage but excessive consumption can cause some adverse problems.

❁❁❁

# Innovative technology in food processing for sustainability

**Dr. Malathy V., Food Technologist, PFNDAI**

## Introduction

One definition of sustainability states it as the practice of maintaining processes of production indefinitely without degrading or endangering natural bio-systems so it meets the needs of present without compromising the ability of future generations to meet their own needs. In case of food industry, it will mean use of resources, equipment, processes and packaging as well as manpower and waste management in a sustainable manner.

Food industry depends on raw materials that can be processed into quality finished products which are then marketed to consumers. The three parts of the industry are thus raw material procurement, processing including packaging and finally consumer. Raw materials of high quality standards are now available in large quantities as required by the food processor. The processors focus has shifted from cost reduction to innovation for sustainability. Innovations are possible in processes as well as packaging.

### *Opportunities for innovative technology in food processing*

- *Resources:* In the face of environmental pressures, climate change and rising energy costs there is a pressing need to improve resource efficiency (including reducing energy and water consumption and waste) of the food production process. Scarcity of resources such as raw materials, energy and water is a major driver for research and development on innovative processes in food industry.

- Society: India is an unusual food and beverage market. Changing lifestyles, nuclear families, more women entering the workforce, increasing disposable income, health consciousness are some of the drivers for innovations in Indian market. Majority of consumers would prefer partially processed food which can be easily cooked and served hot to the family.

- *Market/consumers:* India has seen a tradition of brand trust and dislocation requires innovative processes as well as packaging on the part of competition. Price is another important aspect for the Indian consumer. Small differences in price could change the consumer's preference to competition.

- *Technology:* Novel solutions that facilitate novel practices are required for sustainability in the market. Innovations include quality parameters, process improvements and finally packaging material.

## Rennet – an example of innovation for sustainability

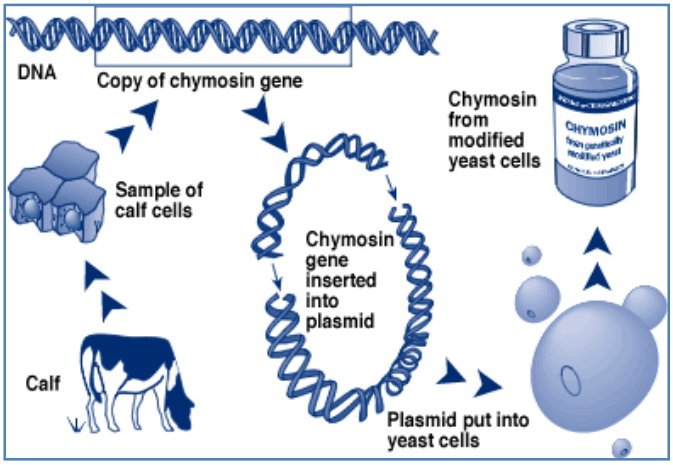
The primary enzyme in rennet driving the clotting process is called chymosin, which acts on milk proteins like casein and causes curdling of milk. This enzyme was first extracted from unweaned calf stomach. However in the 60's, increase in prices of calf rennet combined with decreasing availability due to increase in demand for beef led to sourcing of rennet from microbes. Some plants and microbes (such as the fungus *Rhizopus*) naturally produce enzymes that have coagulating properties like rennet (Neelakantan, 2010). However, rennet from these sources leads to other side reactions in cheese production, leading to undesirable results in taste (bitterness). In the late 1980s, transfer of a single gene from bovine cells that codes for chymosin into microbes was successful, giving microbes the ability to produce chymosin. These genetically modified microbes are allowed to multiply and cultivated in a fermentation process while they produce and release chymosin into the (fig 1) culture liquid. The chymosin can then be separated and purified. Chymosin produced using this method is termed fermentation-produced chymosin, or FPC.

FPC was given Generally Regarded As Safe (GRAS) status by the US Food and Drug Administration in 1990 after 28 months of review. The FDA found that FPC was substantially equivalent to rennet produced from calves, thus it needed no special labeling or indication of its source or method of production. FPC is actually more pure than calf rennet, as it does not contain other proteins from the calf stomach lining that cannot be separated from calf rennet during production. FPC is an important success of innovation using biotechnology for sustainability.
FPC is actually more pure than calf rennet, as it does not contain other proteins from the calf stomach lining that cannot be separated from calf rennet during production (table 1).

**Table 1: Rennet sources and characteristics**

| Type of rennet | Source | Characteristics |
|---|---|---|
| Animal | Calf | Chymosin (88-94%)<br>Bovine pepsin (6-12%) |
| Plant | Dried flowers *Cynara cardunculus* | Plant proteases |
| Microbial | Fungal species e.g. *Rhizomucor miehei* | Microbial proteases |
| Fermentation Produced Chymosin (FPC) | Fungus (bovine chymosin gene cloned into fungus) | Chymosin (100%) |

**Fig 1: Process for manufacture of FPC**

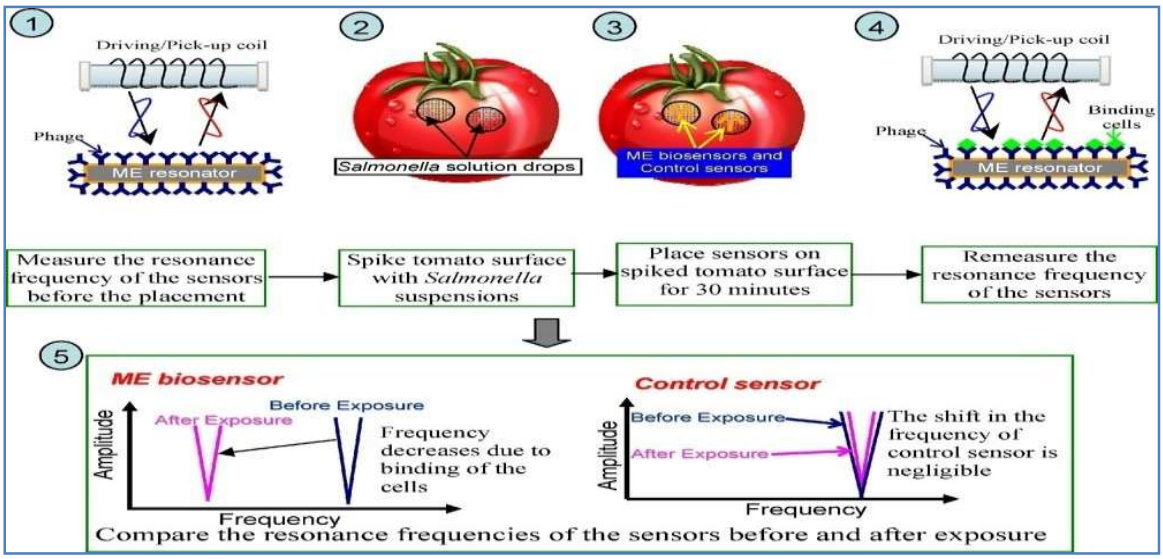



**Smart sensors and labels**

Bacteriophage based smart sensors have been reported for quality checks on raw materials especially microbial contamination of fruits and vegetables. Bacteriophages are viruses that attack bacteria and therefore have specific receptors in their corresponding host. Using this principle, direct detection of *Salmonella typhimurium* on fresh produce using phage-based magnetoelastic (ME) biosensors has been developed. The ME biosensors are wireless sensors composed of a resonator platform coated with

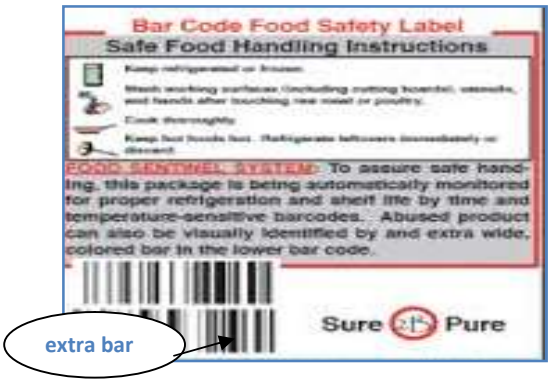
filamentous E2 phage, engineered to bind with *S. typhimurium.* Addition of a small mass (attachment of bacterium) on the resonator surface causes a change in the resonance frequency which is converted into a signal (fig 2). A large number of ME biosensors can be deployed and monitored simultaneously. More importantly, the binding of target pathogens on one out of many ME biosensors can be detected. Therefore, utilizing multiple ME biosensors potentially enables the identification of a small number of pathogens in large volumes of food.

**Fig 2: Phage based biosensor for detection of bacterial contamination in tomatoes**




Graphical barcodes rely on the patterning of optical elements on a microcarrier; some examples include striped rods, ridged particles and dot-patterned particles. 'Nano' bar codes incorporating nanomaterials can be "smart", meaning that it can respond to environmental conditions and/or the presence of pathogens. In an example, a pathogen specific antibody is attached to the packaging material. Presence of contaminating bacteria will lead to extra darkening of a bar rendering it unreadable (fig 3). The result is rejection of the packet.

**Fig 3: Nano bar code for quality**

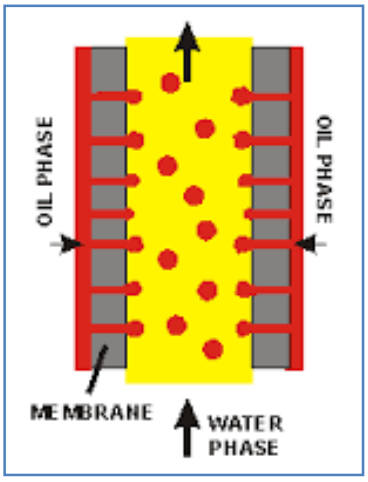



**Membrane based micro emulsions**

Classic emulsification techniques start with a mixture of all emulsion ingredients that are subsequently pushed through a narrow gap, which results in the formation of droplets. In the process of membrane

emulsification, droplets are formed one by one. The to-be-dispersed phase is pushed through a membrane (a sieve with very small pores) and the droplets formed on top of the membrane are sheared off by the cross-flowing continuous phase (fig 4).

**Fig 4: Principle of membrane emulsion**




The emulsification method was used to produce food-grade emulsions (including double emulsions) and foams. This newly developed mild technology proved to be very stable and robust in the production of emulsions especially for heat and shear sensitive functional molecules such as vitamins. Applications include; oil in water emulsion, emulsion in emulsion, microspheres, microcapsules.

**Innovative processing of food industry waste**

Food processing industry generates large volume of waste which are product specific and unavoidable depending upon the finished product. The two approaches for sustainable utilization of waste and by-products are;

Using technologies for reduction in waste production and

Generating valuable materials from the by-products.

For reduction of waste production use of innovative technologies such as enzymes during processing has gained significance recently. One example is use of enzymes such as hemicellulases during processing especially fruits and vegetables such that the moisture content of waste is reduced with increase in yield for the processor and additionally fibres are partially degraded. Another example is use of enzymes in meat processing for utilization of less valuable parts of the animal as restructured products.

In India some waste is also season specific such as fruit processing industry. Most fruits are available in summer and processing is completed within the season. This leads to large volumes of inevitable and mostly edible by products such as peels and fibre. The waste causes major disposal problems for the processor since the waste contains moisture and is affected by microbial spoilage rapidly due to presence of fermentable sugars combined with suitable ambient temperatures for their growth. Generally the waste is quickly disposed in landfills. Other industries such as potato and grain processing are perennial and continuously yield by products.

The fruit and vegetable waste is an economical source of valuable biomolecules such as colours, anti oxidants, sugars, polysaccharides, fibre, and other phytochemicals. Some compounds obtained from various fruits and vegetables and their uses are listed in Table 3.

Some examples of successful conversion of fruit processing industry waste into by-products are citrus and wine industry. Citrus by-products and wastes also contain large amount of colouring material in addition to their complex polysaccharide content. Citrus peel is used largely for pectin manufacture. Other uses are extraction of flavour from the peel as oil, orange peels for marmalade production and even extraction of colour.

**Table 3: Functional compounds from fruit and vegetable processing industry** (Source: Schieber 2001)

| Fruit/Vegetable pomace | Compound from waste | Uses |
|---|---|---|
| *Apple* | Pectin | Gelling |
| | Polyphenols | Antioxidant |
| *Grape* | Tartrates, citric acid, grape seed oil, hydrocolloids, and dietary fibre | Acidulants |
| | Anthocyanins | Colorant |
| *Peach and apricot* | apricot seed oil | cosmetics |
| | pectin | |
| *Mango:* | Seed kernel fat | Cocoa butter substitute |
| | Polyphenols | antioxidant |
| | Pectin | |
| *Pineapple* | sucrose, starch and hemicellulose | Ethanol production |
| | proteolytic enzyme bromelain | Papain substitute |
| *Guava* | Seed oil rich in essential fatty acids | |
| *Tomato* | Tomato seed oil | Rich in unsaturated fatty acids, especially in linoleic acid |
| | Lycopene | Enzymatic treatment of tomato marc enhances lycopene extractability. |
| *Carrot* | Carotenes (2g/kg), uronic acids, and neutral sugars | |
| *Potato:* | Peel phenolic acids | |

Wine processing yields large volumes of grape pomace including skin and seeds. There is a vast array of applications for biomolecules recovered from grape pomace. Grape seeds contain 7-14% oil depending on the cultivar. The composition of the oil is largely linoleic acid (C18:1) which ranges from 69-73% of the total fatty acids( table 2).Increased consumption of linoleic acid in diet has been reported to be useful for reduction of total cholesterol/HDL ratio and LDL/HDL ratio. With a neutral flavour the oil is used by the fragrance industry as a diluent for perfume chemicals and for blending with other expensive oils such as hazel nut and walnut oils. The oil is interesting for the cosmetic industry due to its high vitamin E content (1.65-2.6 g/Kg oil), stearic acid and bioflavonoids which are antioxidants.

Dried and ground, red grape skin powder is an interesting and healthy substitute for synthetic food colour. The pomace from white wine processing has gained attention as an effective biosurfactant in bakery and ice cream products as well as newer applications such as salad dressing. Biosurfactants control consistency, prolong staling and solubilizing of flavour oils, contribute to improving dough stability, texture and volume of bakery products.

With efficient utilization of the waste 100% of the raw material can be processed into natural and useful products resulting in no waste for disposal.

**Table 2: Grape seed oil composition** (Source: Dwyer et al 2014)

| Fatty acid | % |
|---|---|
| Linoleic acid | 72.35 |
| Oleic acid | 16.79 |
| Palmitic acid | 7.22 |
| Stearic acid | 3.07 |
| Linolenic] acid | 0.39 |
| Palmitoleic acid | 0.16 |

Processing of cereals such as rice is a major industry in South East Asian countries including India. This industry has been successful in utilizing all its waste into useful products. Rice straw obtained from harvesting of paddy is useful as animal feed. Additionally it is used as fuel. The byproducts of the rice milling industry are broken rice (20%), bran (5%) and husk (22%). Broken rice is utilized either directly for table purposes or as ingredient in ready mixes for products such as kheer, puttu, upma etc. The other uses of

broken rice are in brewery for grain alcohol and in cattle feed. Rice bran contains 12-15% oil which is obtained by solvent extraction of heat treated bran. The oil (RBO) has gained consumer loyalty due to its hypocholesterolemic and antioxidant effect due to oryzanol and other ferulic acid esters. Rice bran oil refining industry produces residues such as wax sludge, gum sludge and soap stock that are a rich source of many nutraceuticals like oryzanol, tocopherols, tocotrienols, ferulic acid, phytic acid, lecithin, inositol and wax.
Depending on the rice variety, 2-4% wax is obtained during refining of RBO which has application in chewing gums, coating over fruits, for food wraps, in carbon paper and polishing of floor and leather. The wax is reported as a replacement for Carnauba wax which is presently imported. After removal of oil the bran is sold as poultry and cattle feed.

Rice husk mostly used as fuel in boilers for processing paddy and generation of process steam is unusually high in ash (10-20%) compared to other biomass fuels. The ash mainly consists of silica (87-97%) which undergoes structural transformations depending on the conditions of combustion such as time and temperature. The applications of silica is as a source of raw material for silicon compounds such as silicon carbide, silicon nitride, silicon tetrachloride, zeolite, silica, and pure silicon, porous SiO2/C composites for various uses, in rubber industry as reinforcing agent, in cosmetics, in toothpastes as a cleansing agent and in the food industry as an anti-caking agent. Rice husk is used as a raw material for production of xylitol, furfural, ethanol, acetic acid etc. It is used as cleaning or polishing agent in metal and machine industry, in manufacturing of building materials such as porous bricks, as an insulating board material, for making panel board and activated carbon.

**Table 4: Byproducts of rice milling industry and uses (Source Sulochana, 2013)**

| Product | Uses |
|---|---|
| Broken rice (20%) | Directly for kheer, idli or as ingredient in ready mixes |
| Bran (av 5%) | Rice bran oil, animal feed |
| Wax from rice bran oil (2-4% of bran) | Chewing gums, Coating over fruits, polish |
| Husk (22%) | Fuel, silicon tetrachloride, building material, panel board, |
| Husk ash | Carrier for biofertilizer, activated carbon, silica |
| Straw | feed, fuel, silica |

**Conclusion:**
The food processing industry is facing a number of (interdependent) challenges with a potential sizable impact on its future activities and competitiveness. Innovations in food processing techniques and waste utilization can significantly contribute to meeting the needs of the future 10 billion world inhabitants with respect to quality, quantity and sustainability of the process. Innovative technologies will give the processor an edge over competition with improved product at competitive cost and reduced waste. Efficient utilization and processing has converted processing waste into valuable functional by products.
❁❁❁

# RESEARCH IN HEALTH & NUTRITION

**Eating Nuts Lowers Risk of Heart Disease**
March 06, 2015 Food Product Design

Nut lovers will appreciate the newest research published in JAMA this month. After evaluating three large groups consisting of more than 200,000 U.S. and Chinese consumers 40 to 79 years old—with more than 75 percent either overweight or obese, and more than 76 percent had metabolic conditions such as hypertension (55 percent), diabetes (21 percent) and high cholesterol (34 percent)—researchers concluded nuts, particularly peanuts, decreased total deaths by 21 percent and reduced cardiovascular deaths by 38 percent (March 2, 2015).

Peanuts were the primary nuts consumed in the study. They comprised more than 50 percent of the nuts eaten by one of the groups, and in the other two groups (based in Shanghai), only peanut consumption was assessed. Participants recorded in all three groups how frequently they ate the peanuts, nuts or peanut butter.

"Increasing peanut consumption may provide a potentially cost-efficient approach to improving cardiovascular health," said senior author Xio-Ou Shu, M.D., Ph.D., associate director for Global Health at the Vanderbilt-Ingram Cancer Center and professor of Medicine in the Department of Epidemiology.

What's unique about this study is it's the first study to show that all races—black, white and Asian—who are predominantly from lower socioeconomic, high-risk groups could benefit from eating peanuts and peanut butter. Other major studies that have linked peanut and nut consumption with lower mortality focused mainly on higher income, white populations. The link between peanuts and decreased mortality was seen across all ethnicities, for men and women, income status and even for individuals with a high prevalence of metabolic disorders.

The verdict: "Nut consumption was associated with decreased overall and cardiovascular disease mortality across different ethnic groups and among individuals from low socioeconomic status groups. Consumption of nuts, particularly peanuts given their general affordability, may be considered a cost-effective measure to improve cardiovascular health."

Nuts are trending in the snack category and they're popping up in all kinds of food applications, not to mention its mainstay status as a spread, i.e., peanut butter, and now almond butter, cashew butter and more. Consumers love the convenience and healthy halo of nuts. And this study gives them one more reason to say yes to nuts.

❁❁❁

**Smaller, More Frequent Meals Support Healthy Eating**

March 04, 2015 Food Product Design

The snack food industry can capitalize on studies such as the one published earlier this year in the Journal of the Academy of Nutrition and Dietetics (Jan., 22, 2015). Researchers investigated the relationships of frequency and time of eating to energy density, nutrient quality and body mass index (BM)I using data from the International Study on Macro/Micronutrients and Blood Pressure including 2,696 men and women aged 40 to 59 years from the United States and the United Kingdom [study design details are below].

Compared to participants with fewer than four eating occasions in 24 hours, those with six or more eating occasions in 24 hours had lower mean BMI (27.3 vs. 29), total energy intake (2,129 vs. 2,472 kcal/24 hours), dietary energy density (1.5 vs. 2.1 kcal/g) and higher Nutrient Rich Food Index 9.3 (34.3 vs. 28.1). In multiple regression analyses, higher evening intake relative to morning intake was directly associated with BMI; however, the researcher did say that this did not influence the relationship between eating frequency and BMI. These results suggest that a larger number of small meals may be associated with improved diet quality and lower BMI.

Promoting healthy eating and weight management through snacking and smaller-sized meals spread throughout the day is a great angle for the snack and frozen food industries. Individually sized frozen pizzas, lunches and more make it easy for consumers to eat smaller, healthier meals throughout the day. Plus, they are convenient for work lunches or quick dinners after a long day. And, as snacks continue to lose their infamy, i.e., unhealthy and high in salt, fat and calories, and move into the light of a healthy halo, snack companies are engineering some very fun, very tasty and very healthy snacks. Check out our image gallery from last summer on healthy snack launches. My current snack of choice is whole-grain, small-batch rosemary popcorn. Yum. What are you snacking on?

❁❁❁

**Coffee may reduce the risk of developing multiple sclerosis**

A study to be presented at next month's American Academy of Neurology's 67th Annual Meeting shows that drinking coffee may be associated with a lower risk of developing multiple sclerosis (MS). "Caffeine intake has been associated with a reduced risk of Parkinson's and Alzheimer's diseases, and our study shows that coffee intake may also protect against MS, supporting the idea that the drug may have protective effects for the brain," said study author Ellen Mowry, Johns Hopkins University School of Medicine.

The researchers examined a Swedish study of 1,629 people with MS and 2,807 healthy people, and a U.S. study of 1,159 people with MS and 1,172 healthy people. The studies characterized coffee consumption among persons with MS one and five years before MS symptoms began (as well as 10 years before MS symptoms began in the Swedish study) and compared it to coffee consumption of people who did not have

MS at similar time periods. The study also accounted for other factors such as age, sex, smoking, body mass index, and sun exposure habits.

The researchers found that compared to people who drank at least six cups of coffee per day during the year before symptoms appeared, those who did not drink coffee had about a one and a half times increased risk of developing MS. Drinking large amounts of coffee five or 10 years before symptoms started was similarly protective. In the U.S. study, people who didn't drink coffee were also about one and a half times more likely to develop the disease than those who drank four or more cups of coffee per day in the year before MS symptoms started to develop.

IFT Weekly March 1, 2015

❄❄❄

**Salt increases physical performance in resistance competitions**

March 4, 2015 Science Daily
Summary: The effectiveness of salt on sports performance in triathletes has been evaluated by researchers. The athletes who added this supplement to their usual hydration routines during the competition took 26 minutes less to complete a medium-distance triathlon course than those who only used sports drinks.

Half Ironman is a medium-distance triathlon race which consists of 1.9 km of swimming, 90 km of cycling and 21.1 km of athletics.

Spanish researchers have analysed the effectiveness of salt on sports performance in triathletes. The athletes who added this supplement to their usual hydration routines during the competition took 26 minutes less to complete a medium-distance triathlon course than those who only used sports drinks.

Maintaining a suitable balance of water and electrolytes (mainly sodium and chloride) is essential for the functioning of all organs. Human beings compensate for their daily loss with the water and salts provided by their diet's food and drinks.

"However, doing exercise (especially resistance sports and activities carried out in the heat) can compromise the regulation of water and electrolytes," explains Juan del Coso Garrigós, researcher at the Camilo José Cela University (UCJC) and lead author of a study on the effect of salt on sports performance, to SINC.

Scientists from the Exercise Physiology Laboratory at UCJC have analysed the effectiveness of the salt capsules during a Half Ironman, a medium-distance triathlon race which consists of 1.9 km of swimming, 90 km of cycling and 21.1 km of athletics. Their study has just been published in the 'Scandinavian Journal of Medicine & Science in Sports'.

During the research, a group of triathletes ingested, as well as the rehydration drinks that they usually drank, 12 salt capsules divided into three doses during the competition, with the aim of replacing 71% of the sodium lost through sweat. Their results were compared to those of another group of athletes of the same age, experience and with better times previously in a Half Ironman, who during the competition drank sports drinks and capsules filled with a placebo, and therefore, only replaced 20% of the lost sodium.

The triathletes who had ingested the salt ended the competition 26 minutes before the control group on average. Above all their running and cycling speeds improved. "This positive effect on performance relates to an increase in the concentration of electrolytes in the blood, making them drink more fluids during the race (as salt stimulates thirst) and improves the water and electrolyte balances during the competition," adds Del Coso.

As the specialist mentions, sports drinks do not replace 100% of the electrolytes lost through sweat. Nevertheless, for the majority of sports activities lasting less than two hours, the electrolytes that they do contain are sufficient to maintain performance and avoid imbalances.

**Not just any liquid can be used as a replacement**

Sweating is the main mechanism for losing body heat. Sweat glands filter the blood plasma (which contains 142 milliequivalents per litre (mEq/L) of sodium) to obtain a hypotonic fluid, sweat, which evaporates through the skin and dissipates heat. On the other hand, body water and electrolytes are lost through sweat. In healthy people the filtration in the glands reduces the concentration of sodium in sweat to 40-60 mEq/L. For this reason, the main aim of rehydration in sport is to replace lost water and electrolytes.

"If we choose a mineral water as a rehydration drink in sport (which contains 2 mEq/L of sodium), we could generate hypotonicity, given that we would be replacing only the liquid while the concentration of sodium in our blood would gradually become diluted," states Del Coso. Sports drinks are designed to replace lost liquids and electrolytes in sport, but even the best on the market only have a sodium concentration of around 20 mEq/L, approximately half of that lost through sweat.

**Flavour or performance**

For experts, there is a balance between what is considered physiologically recommendable and that which is economically profitable in the world of sports drinks. "Despite sports drinks companies knowing that including more sodium in the drinks would be more beneficial to maintain the balance of fluids and electrolytes during exercise, a greater concentration of sodium would also make the drink have a more salty taste and would reduce the possibilities of succeeding in a market where flavour is key to obtaining good sales figures," says the researcher.

However, in long-distance tests in which large quantities of drinks are ingested to avoid dehydration (marathons, long-distance triathlons, ultra-resistance competitions, etc.) rehydration with these specialised drinks may not be sufficient to maintain the concentration of salt in the body fluids. "It may be necessary to eat food that contains high amounts of salt, such as fruits or nuts, or even salt capsules to reduce the effect of the loss of electrolytes on physical performance," he concludes.

❁❁❁

**Semi-veggie diet effectively lowers heart disease, stroke risk**

March 5, 2015 Science Daily
Summary: A pro-vegetarian diet that emphasizes a higher proportion of plant-based foods compared to animal-based foods may help lower the risks of dying from heart disease and stroke by up to 20 percent,

according to a large-scale study. Researchers suggest that substituting some of the meat in your diet with vegetables may be a simple way to lower the risk of heart-related death.

A pro-vegetarian diet -- one that has a higher proportion of plant-based foods compared to animal-based foods is linked to lower risks of dying from heart disease and stroke, according to new research presented at the American Heart Association EPI/Lifestyle 2015 meeting. In an observational study, researchers analyzed the eating and lifestyle habits of 451,256 Europeans. People who ate the most pro-vegetarian style diets (?70 percent of food coming from plant sources) had a 20 percent lower risk of dying from cardiovascular disease, compared to those who were the least pro-vegetarian (<45 percent).

"A pro-vegetarian diet doesn't make absolute recommendations about specific nutrients. It focuses on increasing the proportion of plant based foods relative to animal-based foods, which results in an improved nutritionally balance diet," said Camille Lassale, Ph.D., lead author and an epidemiologist at Imperial College London's School of Public Health.

Participants were part of the European Prospective Investigation into Cancer and Nutrition (EPIC) study, started in 1992. The study included nearly half a million people from 10 countries who were free of chronic diseases at the start of the study, 35 to 70 years and followed for 12 years on average. Information was collected on their height, weight, food consumption by self-reported food frequency questionnaires, lifestyle and physical activity habits. Causes, and dates of death were obtained from record linkages with boards of health, and active follow-up of participants.

Researchers scored participants based on the types of foods they ate. Points were given for eating foods from seven plant food groups: vegetables, fruit, beans, cereals, potatoes, nuts, and olive oil. Points were subtracted for five animal food groups: meats, animal fats, eggs, fish, and other seafood or dairy products.

Based on their scores, participants were categorized from the least pro-vegetarian to the most. The results were adjusted for age at the start of the study, gender, daily calories, body mass index, smoking status, physical activity, education, alcohol intake and study center. Researchers analyzed the relationship between eating habits and death risks from heart disease and stroke.

"Instead of drastic avoidance of animal-based foods, substituting some of the meat in your diet with plant-based sources may be a very simple, useful way to lower cardiovascular mortality," said Lassale. These findings are in line with the wealth of evidence on benefits of eating plant foods to prevent CVD.

The American Heart Association recommends following a heart-healthy diet, which could also be described as a pro-vegetarian diet. It is high in fruits, vegetables, whole grains, legumes, beans, and nuts, low-fat dairy, beans, skinless poultry, and fish. It encourages eating foods low in saturated and trans fats and sodium, and limiting added sugars and red meats.

❁❁❁

**To reduce body fat, eating less fat may be more effective than eating less carbohydrate**

March 5, 2015 Science Daily
Summary: In adults with obesity, lowering dietary fat may lead to greater body fat loss than lowering dietary carbohydrate, a new study finds.

In adults with obesity, lowering dietary fat may lead to greater body fat loss than lowering dietary carbohydrate, a new study finds. The results will be presented in a poster Thursday, March 5, at ENDO 2015, the annual meeting of the Endocrine Society, in San Diego.

"Calorie for calorie, reducing dietary fat results in more body fat loss than reducing dietary carbohydrate when men and women with obesity have their food intake strictly controlled," said lead study author Kevin D. Hall, PhD, senior investigator at the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) of the National Institutes of Health (NIH) in Bethesda, Maryland.

Nutrition recommendations for people with obesity often conflict as to whether restricting fat or carbohydrate is better for body fat loss. "Ours is the first study to investigate whether the same degree of calorie reduction, either through restricting only fat or restricting only carbohydrate, leads to differing amounts of body fat loss in men and women with obesity," Dr. Hall said

The authors studied 10 men and 9 women with obesity. The average age of the participants was 24 years and their average body mass index was 36 kg per meter squared. All participants were admitted to the metabolic ward of the NIH Clinical Center and resided there 24 hours per day. All food eaten was strictly controlled and the daily activities of the participants were monitored. For 5 days, everyone was fed a eucaloric baseline diet (consisting of 50% carbohydrate, 35% fat, and 15% protein) that gave them the exact number of calories they needed to maintain their body weight.

For the next 6 days, the participants were randomly assigned to one of two groups where they received a 30% reduced-energy diet by having either their fat or carbohydrate intake restricted. After a 2- to 4-week washout period, all participants were readmitted and they repeated the same 5-day eucaloric diet. Those who had eaten 6 days of reduced-fat diet in the first phase now ate a reduced-carbohydrate diet, and those who had eaten the reduced carbohydrate diet now ate the reduced fat diet.

The researchers measured the amount of fat eaten and the amount of fat burned, and the difference between them determined how much fat was lost from the body during each diet. Compared to the reduced carbohydrate diet, the reduced fat diet led to a roughly 67% greater body fat loss.

❁❁❁

**Vegetarian diet linked to lower risk of colorectal cancers**

March 9, 2015 Science Daily
Summary: Eating a vegetarian diet was associated with a lower risk of colorectal cancers compared with nonvegetarians in a study of Seventh-Day Adventist men and women, according to a new article.

Eating a vegetarian diet was associated with a lower risk of colorectal cancers compared with nonvegetarians in a study of Seventh-Day Adventist men and women, according to an article published online by JAMA Internal Medicine.

Colorectal cancer is the second leading cause of cancer death in the United States. Although great attention has been paid to screening, primary prevention through lowering risk factors remains an important objective. Dietary factors have been identified as a modifiable risk factor for colorectal cancer, including red meat which is linked to increased risk and food rich in dietary fiber which is linked to reduced risk, according to the study background.

Among 77,659 study participants, Michael J. Orlich, M.D., Ph.D., of Loma Linda University, California, and coauthors identified 380 cases of colon cancer and 110 cases of rectal cancer. Compared with nonvegetarians, vegetarians had a 22 percent lower risk for all colorectal cancers, 19 percent lower risk for colon cancer and 29 percent lower risk for rectal cancer. Compared with nonvegetarians, vegans had a 16 percent lower risk of colorectal cancer, 18 percent less for lacto-ovo (eat milk and eggs) vegetarians, 43 percent less in pescovegetarians (eat fish) and 8 percent less in semivegetarians, according to study results.

"If such associations are causal, they may be important for primary prevention of colorectal cancers. … The evidence that vegetarian diets similar to those of our study participants may be associated with a reduced risk of colorectal cancer, along with prior evidence of the potential reduced risk of obesity, hypertension, diabetes and mortality, should be considered carefully in making dietary choices and in giving dietary guidance," the study concludes.

❁❁❁

**High cholesterol, triglycerides can keep vitamin E from reaching body tissues**

March 12, 2015 Science Daily
Summary: In the continuing debate over how much vitamin E is enough, a new study has found that high levels of blood lipids such as cholesterol and triglycerides can keep this essential micronutrient tied up in the blood stream, and prevent vitamin E from reaching the tissues that need it. This raises new questions about whether or not most people have an adequate intake of vitamin E.

In the continuing debate over how much vitamin E is enough, a new study has found that high levels of blood lipids such as cholesterol and triglycerides can keep this essential micronutrient tied up in the blood stream, and prevent vitamin E from reaching the tissues that need it. The research, just published in the American Journal of Clinical Nutrition, also suggested that measuring only blood levels may offer a distorted picture of whether or not a person has adequate amounts of this vitamin, and that past methods of estimating tissue levels are flawed.

The findings are significant, the scientists say, because more than 90 percent of the people in the United States who don't take supplements lack the recommended amount of vitamin E in their diet. Vitamin E is especially important in some places such as artery walls, the brain, liver, eyes and skin, but is essential in just about every tissue in the body. A powerful, fat-soluble antioxidant, it plays important roles in scavenging free radicals and neurologic function. In the diet, it's most commonly obtained from cooking oils and some vegetables.

Some experts have suggested that recommended levels of vitamin E should be lowered. But because of these absorption issues, the recommended level of 15 milligrams per day is about right, said Maret Traber, the lead author of this study. Inadequate vitamin E intake remains a significant societal problem, she said.

"This research raises particular concern about people who are obese or have metabolic syndrome," said Traber, who is the Helen P. Rumbel Professor for Micronutrient Research in the College of Public Health and Human Sciences at Oregon State University, and a principal investigator in OSU's Linus Pauling Institute.

"People with elevated lipids in their blood plasma are facing increased inflammation as a result," Traber said. "Almost every tissue in their body is under oxidative attack, and needs more vitamin E. But the vitamin E needed to protect these tissues is stuck on the freeway, in the circulatory system. It's going round and round instead of getting to the tissues where it's needed."

This research was done with 41 men and women, including both younger and older adults, who obtained vitamin E by eating deuterium-labeled collard greens, so the nutrient could be tracked as it moved through the body. Of some interest, it did not find a significant difference in absorption based solely on age or gender. But there was a marked difference in how long vitamin E stayed in blood serum, based on higher level of lipids in the blood -- a more common problem as many people age or gain weight.

The study also incorporated a different methodology, using a stable isotope instead of radioactive tracers, than some previous research, to arrive at the estimates of vitamin E that made it to body tissues. Using the stable isotope methodology that these researchers believe is more accurate, they concluded that only 24

percent of vitamin E is absorbed into the body, instead of previous estimates of 81 percent measured by the use of radioactive vitamin E.

"In simple terms, we believe that less than one third the amount of vitamin E is actually making it to the tissues where it's most needed," Traber said. Vitamin E in the blood stream is not completely wasted, Traber noted. There, it can help protect LDL and HDL cholesterol from oxidation, which is good. But that doesn't offset the concern that not enough of this micronutrient may be reaching tissues, she said.

❁❁❁

**Milk protein comparison unveils nutritional gems for developing babies**

March 16, 2015 Science Daily
Summary: Human babies appear to need more of a nutritional boost from breast-milk proteins than do infants of one of their closest primate relatives, suggests a study comparing human milk with the milk of rhesus macaque monkeys.

Human babies appear to need more of a nutritional boost from breast-milk proteins than do infants of one of their closest primate relatives, suggests a study comparing human milk with the milk of rhesus macaque monkeys. The research team, led by the University of California, Davis, came to this conclusion after developing a new technique for comparing the proteome -- all detectable proteins -- of human milk with the proteome of the rhesus macaque monkey.

The researchers expect the findings will provide a better understanding of human breast-milk composition and identify fundamental nutrients that should be included in infant formula. The study, which revealed the first comprehensive macaque milk proteome and newly identified 524 human milk proteins, is reported online in the Journal of Proteome Research.

"Human milk provides a recipe for human nutrition during the neonatal period," said principal investigator Danielle Lemay, a nutritional biologist at the UC Davis Genome Center. "But because so much remains to be understood about milk's molecular composition, we developed a new technique for analyzing milk proteomics that overcomes earlier barriers," she said.

Using this new method, Lemay and colleagues identified 1,606 proteins in human milk and 518 proteins in rhesus macaque milk. These included 88 milk proteins that were common to both species, but at different levels. Ninety-three percent of those shared proteins were more abundant in human milk than in macaque milk. For example, the researchers found that human milk contained significantly higher levels of milk proteins that help in digestion of fat-like compounds; slow protein digestion; and potentially increase the absorption of iron, vitamin B-12, and vitamin D.

"The higher levels of these proteins in human milk are consistent with the well-established perspective that human babies, compared to other primate infants, are born at a slightly earlier stage of development and require higher levels of specific proteins that will nurture them as they mature," Lemay said.

She noted that these proteins found at higher levels in human milk include specific proteins that are enriched in human brain tissues, suggesting that they may be involved in neurodevelopment. "Proteins that appear to have neurodevelopmental significance for human babies will be key targets for future research focused on enhancing infant formula," Lemay said.

❁❁❁

**Recommendation for vitamin D intake was miscalculated, is far too low, experts say**

March 17, 2015 Science Daily
Summary: Researchers are challenging the intake of vitamin D recommended by the National Academy of Sciences Institute of Medicine saying their Recommended Dietary Allowance for vitamin D underestimates the need by a factor of ten.

Researchers at UC San Diego and Creighton University have challenged the intake of vitamin D recommended by the National Academy of Sciences (NAS) Institute of Medicine (IOM), stating that their Recommended Dietary Allowance (RDA) for vitamin D underestimates the need by a factor of ten.

In a letter published last week in the journal Nutrients the scientists confirmed a calculation error noted by other investigators, by using a data set from a different population. Dr. Cedric F. Garland, Dr.P.H., adjunct professor at UC San Diego's Department of Family Medicine and Public Health said his group was able to confirm findings published by Dr. Paul Veugelers from the University of Alberta School of Public Health that were reported last October in the same journal.

"Both these studies suggest that the IOM underestimated the requirement substantially," said Garland. "The error has broad implications for public health regarding disease prevention and achieving the stated goal of ensuring that the whole population has enough vitamin D to maintain bone health."

The recommended intake of vitamin D specified by the IOM is 600 IU/day through age 70 years, and 800 IU/day for older ages. "Calculations by us and other researchers have shown that these doses are only about one-tenth those needed to cut incidence of diseases related to vitamin D deficiency," Garland explained.

Robert Heaney, M.D., of Creighton University wrote: "We call for the NAS-IOM and all public health authorities concerned with transmitting accurate nutritional information to the public to designate, as the RDA, a value of approximately 7,000 IU/day from all sources."

"This intake is well below the upper level intake specified by IOM as safe for teens and adults, 10,000 IU/day," Garland said.

❁❁❁

**Vitamin D may help prevent, treat diseases associated with aging**

March 17, 2015 Science Daily
Summary: Vitamin D may play a vital role in the prevention and treatment of diseases associated with aging, according to researchers. Researchers reviewed evidence that suggests an association between vitamin D deficiency and chronic diseases associated with aging such as cognitive decline, depression, osteoporosis, cardiovascular disease, high blood pressure, Type 2 diabetes and cancer.

Vitamin D may play a vital role in the prevention and treatment of diseases associated with aging, according to researchers at Loyola University Chicago Marcella Niehoff School of Nursing (MNSON). These findings were published in the latest issue of the Journal of Aging and Gerontology.

Researchers reviewed evidence that suggests an association between vitamin D deficiency and chronic diseases associated with aging such as cognitive decline, depression, osteoporosis, cardiovascular disease, high blood pressure, Type 2 diabetes and cancer.

"Vitamin D deficiency is a common, serious medical condition that significantly affects the health and well-being of older adults," said Sue Penckofer, PhD, RN, study author and full professor, MNSON.

Older adults are at risk for vitamin D deficiency due to diet, reduced time outdoors and poor skin absorption of the nutrient. With the number of people ages 65 and older expected to more than double from 2012 to 2060, the problem will become much more prevalent.

"Better understanding the relationship between vitamin D and chronic diseases in older adults and whether treatment of vitamin D deficiency can prevent or treat these disorders is important given the increasing number of people at risk for these health issues," said Meghan Meehan, FNP-BC '13, study author, MNSON.

The Institute of Medicine generally recommends that adults up to 70 years of age take 600 IU of vitamin D daily and adults over the age of 70 consume 800 IU of the nutrient daily.

Study authors concluded that as the older population continues to grow, universal guidelines for testing and treating vitamin D deficiency are needed. Research to examine the proper dosing of vitamin D supplements necessary to prevent the chronic diseases of aging also would have significant benefit for future generations.

❁❁❁

**Suggestions for Nudging Children toward Healthier Food Choices**

March 23, 2015 Science Daily
Summary: Strategies aimed at reducing childhood obesity should acknowledge individuals' rational taste preferences and apply insights from behavioral economics to design choice architecture that increases their likelihood of success, say two physician-scientists.

Strategies aimed at reducing childhood obesity should acknowledge individuals' rational taste preferences and apply insights from behavioral economics to design choice architecture that increases their likelihood of success, say two physician-scientists from the Perelman School of Medicine at the University of Pennsylvania and the Center for Health Incentives and Behavioral Economics in an editorial published in JAMA Pediatrics.

Noting that "almost one-third of children in the United States are overweight or obese, a level that has not improved over the past decade," the editorial authors outline three strategies for using behavioral economics (which recognizes that individuals behave irrationally when making decisions, but often in predictable manners) and choice architecture (which applies insights from behavioral economics to real-life scenarios) to change behaviors related to food choice. The editorial, co-written by Mitesh S. Patel, MD, MBA, MS, assistant professor, and Kevin G. Volpp, MD, PhD, professor, both of Medicine and Health Care Management at Penn, accompanies an article on a study using a clinical trial to test interventions to change students' food choices at school.

"The results of this study highlight that the design of food choices can significantly influence behavior," said Patel. "Lessons from this intervention in school cafeterias could be applied more broadly in settings that impact both children and adults."

First, school leaders and dieticians should recognize the fact that children (and adults) are behaving rationally when they choose foods that taste better. Accepting this reality, the authors point to efforts to make school-based meals more palatable -- but still healthy -- through collaborations with professional chefs, such as First Lady Michelle Obama's Chefs Move to Schools program. They note research findings showing that chef involvement increases the consumption of healthier foods by children.

Next, default (or "opt out") options should be used to steer children to healthier food choices and portion sizes. For example, in a cafeteria self-service food line, placing fruit and vegetables at the front of the line when plates are relatively empty was found to increase consumption of these foods. (It is a marketing truism that placing certain "guilty pleasure" items near the cashier increases impulse buying, but this usually

involves cases of immediate gratification, such as candy, and less so foods that lead to longer-term health benefits.)

Third, making food information more appealingly and health benefits more understandable to children may lead to healthier food choices. The authors suggest that "nutritional value might better be displayed using a color-coded scheme that is easily relatable, such as that of a traffic light," to help children easily choose which foods to eat and which to avoid. The authors also cite previous research indicating that rewards of as little as 25 cents per day have led to a doubling in consumption of fruits and vegetables, even after the intervention period ended.

"Lessons from behavioral economics could be used to develop interventions that help build better eating habits," said Volpp. "Default options, information framing and incentives are a few areas that show promise and should continue to be evaluated in future studies." The Penn-authored JAMA Pediatrics editorial is in reference to "Effects of choice architecture and chef-enhanced meals on the selection and consumption of healthier school foods: a randomized clinical trial" by Cohen et al, also published in the current issue of JAMA Pediatrics.

❁❁❁

**Zinc deficiency linked to immune system response, particularly in older adults**

March 23, 2015 Science Daily
Summary: Zinc, an important mineral in human health, appears to affect how the immune system responds to stimulation, especially inflammation, new research shows. Zinc deficiency could play a role in chronic diseases such as cardiovascular disease, cancer and diabetes that involve inflammation. Such diseases often show up in older adults, who are more at risk for zinc deficiency.


Oysters are high in zinc.

Zinc, an important mineral in human health, appears to affect how the immune system responds to stimulation, especially inflammation, new research from Oregon State University shows. Zinc deficiency could play a role in chronic diseases such as cardiovascular disease, cancer and diabetes that involve inflammation. Such diseases often show up in older adults, who are more at risk for zinc deficiency.

"When you take away zinc, the cells that control inflammation appear to activate and respond differently; this causes the cells to promote more inflammation," said Emily Ho, a professor and director of the Moore Family Center for Whole Grain Foods, Nutrition and Preventive Health in the OSU College of Public Health and Human Sciences, and lead author of the study.

Zinc is an essential micronutrient required for many biological processes, including growth and development, neurological function and immunity. It is naturally found in protein-rich foods such as meat and shellfish, with oysters among the highest in zinc content.

Approximately 12 percent of people in the U.S. do not consume enough zinc in their diets. Of those 65 and older, closer to 40 percent do not consume enough zinc, Ho said. Older adults tend to eat fewer zinc-rich foods and their bodies do not appear to use or absorb zinc as well, making them highly susceptible to zinc deficiency. "It's a double-whammy for older individuals," said Ho, who also is a principal investigator with the Linus Pauling Institute.

In the study, researchers set out to better understand the relationship between zinc deficiency and inflammation. They conducted experiments that indicated zinc deficiency induced an increase in inflammatory response in cells. The researchers were able to show, for the first time, that reducing zinc caused improper immune cell activation and dysregulation of a cytokine IL-6, a protein that affects inflammation in the cell, Ho said.

Researchers also compared zinc levels in living mice, young and old. The older mice had low zinc levels that corresponded with increased chronic inflammation and decreased IL-6 methylation, which is an epigenetic mechanism that cells use to control gene expression. Decreased IL-6 methylation also was found in human immune cells from elderly people, Ho said. Together, the studies suggest a potential link between zinc deficiency and increased inflammation that can occur with age, she said.

The findings were published recently in the journal Molecular Nutrition & Food Research. Co-authors are Carmen P. Wong and Nicole A. Rinaldi of the College of Public Health. The research was supported by the Oregon Agricultural Experiment Station, Bayer Consumer Care AG of Switzerland, and OSU.

Understanding the role of zinc in the body is important to determining whether dietary guidelines for zinc need to be adjusted. The recommended daily intake of zinc for adults is 8 milligrams for women and 11 milligrams for men, regardless of age. The guidelines may need to be adjusted for older adults to ensure they are getting enough zinc, Ho said.

There is no good clinical biomarker test to determine if people are getting enough zinc, so identifying zinc deficiency can be difficult. In addition, the body does not have much ability to store zinc, so regular intake is important, Ho said. Getting too much zinc can cause other problems, including interfering with other minerals. The current upper limit for zinc is 40 milligrams per day. "We think zinc deficiency is probably a bigger problem than most people realize," she said. "Preventing that deficiency is important." Understanding why older adults do not take in zinc as well is an important area for future research, Ho said. Additional research also is needed to better understand how zinc works in the body, she said.

❁❁❁

**Milk could be good for your brain**

March 24, 2015 Science Daily
Summary: A correlation between milk consumption and the levels of a naturally-occurring antioxidant called glutathione in the brain has been discovered in older, healthy adults.

New research conducted at the University of Kansas Medical Center has found a correlation between milk consumption and the levels of a naturally-occurring antioxidant called glutathione in the brain in older, healthy adults.

In-Young Choi, Ph.D., an associate professor of neurology at KU Medical Center, and Debra Sullivan, Ph.D., professor and chair of dietetics and nutrition at KU Medical Center, worked together on the project. Their research, which was published in the Feb. 3, 2015 edition of The American Journal of Clinical Nutrition, suggests a new way that drinking milk could benefit the body.

"We have long thought of milk as being very important for your bones and very important for your muscles," Sullivan said. "This study suggests that it could be important for your brain as well." Choi's team asked the 60 participants in the study about their diets in the days leading up to brain scans, which they used to monitor levels of glutathione -- a powerful antioxidant -- in the brain.

The researchers found that participants who had indicated they had drunk milk recently had higher levels of glutathione in their brains. This is important, the researchers said, because glutathione could help stave off oxidative stress and the resulting damage caused by reactive chemical compounds produced during the normal metabolic process in the brain. Oxidative stress is known to be associated with a number of different diseases and conditions, including Alzheimer's disease, Parkinson's disease and many other conditions, said Dr. Choi.

"You can basically think of this damage like the buildup of rust on your car," Sullivan said. "If left alone for a long time, the buildup increases and it can cause damaging effects. Few Americans reach the recommended daily intake of three dairy servings per day, Sullivan said. The new study showed that the closer older adults came to those servings, the higher their levels of glutathione were. "If we can find a way to fight this by instituting lifestyle changes including diet and exercise, it could have major implications for brain health," Choi said.

An editorial in the same edition of The American Journal of Clinical Nutrition said the study presented "a provocative new benefit of the consumption of milk in older individuals," and served as a starting point for further study of the issue. "Antioxidants are a built-in defense system for our body to fight against this damage, and the levels of antioxidants in our brain can be regulated by various factors such as diseases and lifestyle choices," Choi said.

For the study, researchers used high-tech brain scanning equipment housed at KU Medical Center's Hoglund Brain Imaging Center. "Our equipment enables us to understand complex processes occurring that are related to health and disease," Choi said. "The advanced magnetic resonance technology allowed us to be in a unique position to get the best pictures of what was going on in the brain."

A randomized, controlled trial that seeks to determine the precise effect of milk consumption on the brain is still needed and is a logical next step to this study, the researchers said.

❁❁❁

**New low-calorie way to cook rice could help cut rising obesity rates**

March 23, 2015 Science Daily
Summary: Scientists have developed a new, simple way to cook rice that could cut the number of calories absorbed by the body by more than half, potentially reducing obesity rates, which is especially important in countries where the food is a staple.

Scientists have developed a new, simple way to cook rice that could cut the number of calories absorbed by the body by more than half, potentially reducing obesity rates, which is especially important in countries where the food is a staple.

The number of people who are overweight or obese is steadily increasing. As lifestyles change and people become more sedentary, their diets also change. Serving sizes grow, and more food options become available. In addition to consuming more fats and sugars, people may choose to fill up on starchy carbohydrates like rice, which has about 240 calories per cup.

"Because obesity is a growing health problem, especially in many developing countries, we wanted to find food-based solutions," says team leader Sudhair A. James, who is at the College of Chemical Sciences,

Colombo, Western, Sri Lanka. "We discovered that increasing rice resistant starch (RS) concentrations was a novel way to approach the problem." By using a specific heating and cooking regimen, he says, the scientists concluded that "if the best rice variety is processed, it might reduce the calories by about 50-60 percent."

He explains that starch can be digestible or indigestible. Starch is a component of rice, and it has both types. Unlike digestible types of starch, RS is not broken down in the small intestine, where carbohydrates normally are metabolized into glucose and other simple sugars and absorbed into the bloodstream. Thus, the researchers reasoned that if they could transform digestible starch into RS, then that could lower the number of usable calories of the rice.

And rice is loaded with starch (1.6 ounces in a cup), says James. "After your body converts carbohydrates into glucose, any leftover fuel gets converted into a polysaccharide carbohydrate called glycogen," he explains. "Your liver and muscles store glycogen for energy and quickly turn it back into glucose as needed. The issue is that the excess glucose that doesn't get converted to glycogen ends up turning into fat, which can lead to excessive weight or obesity."

The team experimented with 38 kinds of rice from Sri Lanka, developing a new way of cooking rice that increased the RS content. In this method, they added a teaspoon of coconut oil to boiling water. Then, they added a half a cup of rice. They simmered this for 40 minutes, but one could boil it for 20-25 minutes instead, the researchers note. Then, they refrigerated it for 12 hours. This procedure increased the RS by 10 times for traditional, non-fortified rice.

How can such a simple change in cooking result in a lower-calorie food? James explains that the oil enters the starch granules during cooking, changing its architecture so that it becomes resistant to the action of digestive enzymes. This means that fewer calories ultimately get absorbed into the body. "The cooling is essential because amylose, the soluble part of the starch, leaves the granules during gelatinization," explains James. "Cooling for 12 hours will lead to formation of hydrogen bonds between the amylose molecules outside the rice grains which also turns it into a resistant starch." Reheating the rice for consumption, he notes, does not affect the RS levels.

He says that the next step will be to complete studies with human subjects to learn which varieties of rice might be best suited to the calorie-reduction process. The team also will check out whether other oils besides coconut have this effect.

❁❁❁

**Pregnant women not getting enough omega-3, critical for infant development, research shows**

March 25, 2015 Science Daily
Summary: A research team studied the first 600 women in a cohort during and after their pregnancy to see whether they were consuming enough omega-3 long chain polyunsaturated fatty acids (omega 3-LCPUFA) to meet current recommendations. They found that in fact, most of these women were not.

Alberta Pregnancy Outcomes and Nutrition (APrON) is a birth cohort involving over two thousand women and their infants from Calgary and Edmonton that was funded by Alberta Innovates Health Solutions and includes researchers at the University of Alberta and the University of Calgary. The main objective of APrON is to understand the relationship between maternal nutrient status during pregnancy and maternal mental health and child health and development. As part of the project, the APrON team studied the first 600 women in the cohort during and after their pregnancy to see whether they were consuming enough omega-3 long chain polyunsaturated fatty acids (omega 3-LCPUFA) to meet current recommendations. The team has just published their results in the journal Applied Physiology, Nutrition, and Metabolism.

Omega-3 LCPUFA include eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA) and docosahexaenoic acid (DHA). A source of these is required during pregnancy for fetal and placental development and is critical for the development of the infant, particularly for brain development.

The American Dietetic Association along with Dietitians of Canada recommends that all healthy adults including pregnant and lactating women consume at least 500 mg/day of omega-3 LCPUFA. The European Commission and the International Society for the Study of Fatty Acids and Lipids (ISSFAL) specifically recommends that pregnant and lactating women consume a minimum of 200 mg DHA per day.

The women from this group of APrON participant lived in Edmonton and Calgary. The team found that the majority of participants, despite a high level of education and income, were not meeting these recommendations for omega-3 LCPUFA during pregnancy and lactation.

According to the study: "Only 27% of women during pregnancy and 25% at three months postpartum met the current European Union (EU) consensus recommendation for DHA. Seafood, fish and seaweed products contributed to 79% of overall n-3 long chain polyunsaturated fatty acids intake from foods, with the majority from salmon. Results suggest that the majority of women in the cohort were not meeting the EU recommendation for DHA during pregnancy and lactation."

The current study found women who took a supplement containing DHA were 10.6 and 11.1 times more likely to meet the current EU consensus recommendation for pregnancy and postpartum, respectively. Recommendations could also be met by following the Health Canada recommendation to consume one to two portions per week of fish high in omega-3 fatty acids.

The results of this also study suggests that nutritional counseling and education about benefits of a supplement source of LCPUFA should extend beyond pregnancy as 44% percent of the women in the cohort who reported taking a supplement during pregnancy were no longer taking these supplements when breast feeding at three months postpartum.

The current study provides useful information for health practitioners and for future interventions (dietary or supplement recommendations) aimed at helping women obtain LCPUFA in their diet to ensure they are able to meet the needs of their infants.

❁❁❁

**Consuming eggs with raw vegetables increases nutritive value**

March 29, 2015 Science Daily
Summary: There is burgeoning research showing that co-consuming cooked whole eggs with your veggies can increase carotenoids absorption. With the recent scientific report from the 2015 Dietary Guidelines Advisory Committee lessening past concern over cholesterol in eggs, this is particularly good news.

There is burgeoning research showing that co-consuming cooked whole eggs with your veggies can increase carotenoids absorption. With the recent scientific report from the 2015 Dietary Guidelines Advisory Committee lessening past concern over cholesterol in eggs, this is particularly good news.

"Americans under consume vegetables, and here we have a way to increase the nutritive value of veggies while also receiving the nutritional benefits of egg yolks," said Wayne Campbell, Ph.D., Professor of Nutrition Science, Purdue University.

Campbell, working with postdoc fellow Jung Eun Kim, Ph.D., R.D., conducted a study to assess the effects of egg consumption on carotenoid absorption from a raw mixed-vegetable salad. Sixteen healthy young men ate

three versions of the salad -- one with no egg, one with 1.5 scrambled whole eggs, and another with 3 scrambled whole eggs. Those who ate the highest egg amount with the salad of tomatoes, shredded carrots, baby spinach, romaine lettuce, and Chinese wolfberry increased absorption of carotenoids 3-9 fold. This is a very significant effect, said Campbell. The carotenoids found in the salad include beta-carotene, alpha-carotene, lycopene, lutein, and zeaxanthin, the latter two being found in egg yolk as well.

The research grew out of his group's previous study showing that by adding certain oils to mixed raw vegetables, the consumer experienced enhanced absorption of carotenoids. "Next time you visit a salad bar, consider adding the cooked egg to your raw veggies," said Campbell. "Not only are lutein and zeaxanthin available through whole eggs, but now the value of the vegetables is enhanced."

The research findings will be presented at the American Society for Nutrition's Annual Meeting during Experimental Biology 2015. Campbell believes the beneficial effects seen in this college-age population will extend to all populations and ages. His group would like to expand their research to explore the effects on other fat-soluble nutrients including vitamin E and vitamin D.

❁❁❁

**Eating green leafy vegetables keeps mental abilities sharp**

March 30, 2015 Science Daily
Summary: Something as easy as adding more spinach, kale, collards and mustard greens to your diet could help slow cognitive decline, according to new research. The study also examined the nutrients responsible for the effect, linking vitamin K consumption to slower cognitive decline for the first time.

Something as easy as adding more spinach, kale, collards and mustard greens to your diet could help slow cognitive decline, according to new research. The study also examined the nutrients responsible for the effect, linking vitamin K consumption to slower cognitive decline for the first time.

"Losing one's memory or cognitive abilities is one of the biggest fears for people as they get older," said Martha Clare Morris, Sc.D., assistant provost for community research at Rush University Medical Center and leader of the research team. "Since declining cognitive ability is central to Alzheimer's disease and dementias, increasing consumption of green leafy vegetables could offer a very simple, affordable and non-invasive way of potentially protecting your brain from Alzheimer's disease and dementia."

The researchers tracked the diets and cognitive abilities of more than 950 older adults for an average of five years and saw a significant decrease in the rate of cognitive decline for study participants who consumed greater amounts of green leafy vegetables. People who ate one to two servings per day had the cognitive ability of a person 11 years younger than those who consumed none.

When the researchers examined individual nutrients linked with slowing cognitive decline, they found that vitamin K, lutein, folate and beta-carotene were most likely helping to keep the brain healthy.

"Our study identified some very novel associations," said Morris, who will present the research at the American Society for Nutrition (ASN) Annual Meeting during Experimental Biology 2015. "No other studies have looked at vitamin K in relation to change in cognitive abilities over time, and only a limited number of studies have found some association with lutein." Other studies have linked folate and beta-carotene intake with slower cognitive decline.

To conduct the study, Morris' research team gathered data from 954 participants from the Memory and Aging Project, which aims to identify factors associated with the maintenance of cognitive health. The participants, whose age averaged 81, reported their daily food and beverage intake by answering a detailed 144-item questionnaire at the beginning of the study. The researchers computed the total daily nutrients by combining

the nutrient content for each food consumed with the number of servings eaten each day. They followed participants for 2 to 10 years, assessing cognition annually with a comprehensive battery of 19 tests and adjusted for age, sex, education, smoking, genetic risk for Alzheimer's disease and participation in physical activities when estimating the effects of diet on cognitive decline.

"With baby boomers approaching old age, there is huge public demand for lifestyle behaviors that can ward off loss of memory and other cognitive abilities with age," said Morris. "Our study provides evidence that eating green leafy vegetables and other foods rich in vitamin K, lutein and beta-carotene can help to keep the brain healthy to preserve functioning."

In addition to green leafy vegetables, other good sources of vitamin K, lutein, folate and beta-carotene include brightly colored fruits and vegetables. The researchers would like to expand their research to explore the mechanisms of how nutrients in leafy green vegetables are acting on the brain.

❁❁❁

**Omega-3 fatty acids and vitamin D may control brain serotonin**
2 March 2015 Medical News Today

Although essential marine omega-3 fatty acids and vitamin D have been shown to improve cognitive function and behavior in the context of certain brain disorders, the underlying mechanism has been unclear. In a new paper published in FASEB Journal by Rhonda Patrick, PhD and Bruce Ames, PhD of Children's Hospital Oakland Research Institute (CHORI), serotonin is explained as the possible missing link tying together why vitamin D and marine omega-3 fatty acids might ameliorate the symptoms associated with a broad array of brain disorders.

In a previous paper published last year, authors Patrick and Ames discussed the implications of their finding that vitamin D regulates the conversion of the essential amino acid tryptophan into serotonin, and how this may influence the development of autism, particularly in developing children with poor vitamin D status.

Here they discuss the relevance of these micronutrients for neuropsychiatric illness. Serotonin affects a wide-range of cognitive functions and behaviors including mood, decision-making, social behavior, impulsive behavior, and even plays a role in social decision-making by keeping in check aggressive social responses or impulsive behavior.

Many clinical disorders, such as autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), bipolar disorder, schizophrenia, and depression share as a unifying attribute low brain serotonin. "In this paper we explain how serotonin is a critical modulator of executive function, impulse control, sensory gating, and pro-social behavior," says Dr. Patrick. "We link serotonin production and function to vitamin D and omega-3 fatty acids, suggesting one way these important micronutrients help the brain function and affect the way we behave."

Eicosapentaenoic acid (EPA) increases serotonin release from presynaptic neurons by reducing inflammatory signaling molecules in the brain known as E2 series prostaglandins, which inhibit serotonin release and suggests how inflammation may negatively impact serotonin in the brain. EPA, however, is not the only omega-3 that plays a role in the serotonin pathway. Docosahexaenoic acid (DHA) also influences the action of various serotonin receptors by making them more accessible to serotonin by increasing cell membrane fluidity in postsynaptic neurons.

Their paper illuminates the mechanistic links that explain why low vitamin D, which is mostly produced by the skin when exposed to sun, and marine omega-3 deficiencies interacts with genetic pathways, such as the serotonin pathway, that are important for brain development, social cognition, and decision-making, and how

these gene-micronutrient interactions may influence neuropsychiatric outcomes. "Vitamin D, which is converted to a steroid hormone that controls about 1,000 genes, many in the brain, is a major deficiency in the US and omega-3 fatty acid deficiencies are very common because people don't eat enough fish," said Dr. Ames.

❁❁❁

**Why nitrate supplementation may increase athletic performance**
4 March 2015 Medical News Today

**New research in The FASEB Journal suggests that nitrate -- a nitric oxide metabolite -- meets tissue oxygen demands without the side effects of increasing red blood cells or blood viscosity**

Walk down the aisles of any food supplement store and you'll see that the use of nitrate supplements by athletes and fitness buffs has been popular for years. The hope is that these supplements will increase endurance (and possibly other performance/health benefits) by improving the efficiency at which muscles use oxygen. Now, a research study published in the March 2015 issue of The FASEB Journal helps explain how some of these supplements may work and why they may increase performance--they decrease the viscosity of blood, aiding in blood flow, while at the same time ensuring that tissue oxygen requirements are not compromised.

"Our research sheds new light on how oxygen delivery to bodily tissues is controlled to support mammalian life, and what role the kidneys and the liver play in achieving this," said Andrew Murray, Ph.D., a researcher involved in the work from the Department of Physiology, Development and Neuroscience at the University of Cambridge in Cambridge, United Kingdom. "These findings offer potential therapeutic avenues for dietary intervention in polycythemia and other conditions that warrant a reduction in red cell mass, but may have broader implications related to the way that supply and demand of oxygen are matched."

Scientists investigated the effects of nitrate supplementation on hemoglobin in four groups of rats, which were housed in either normoxic or hypoxic (low oxygen) conditions and supplemented with sodium nitrate (or sodium chloride, ordinary table salt, as a control). Intake of nitrate via diet and drinking water was carefully monitored. Hypoxia is known to elevate hemoglobin levels, but nitrate supplementation at a moderate dose largely suppressed this effect. Unexpectedly, nitrate also lowered hemoglobin levels in normoxic animals. They found that at higher doses of nitrate, hemoglobin levels began to rise again. Researchers investigated the mechanisms underlying these effects and found that the suppression of hemoglobin was due to nitrate enhancing liver oxygenation and suppressing its expression of the hormone, erythropoietin. Conversely, as hemoglobin levels fell, the kidney became less well supplied with oxygen and at higher doses of nitrate it expressed more erythropoietin, reversing the effect.

"This doesn't mean that taking a nitrate supplement will transform you into the next Marshawn Lynch," said Gerald Weissmann, M.D., Editor-in-Chief of The FASEB Journal. "What it does mean, however, is that we're beginning to understand the science behind why some people feel they turn into the Seahawk's 'Beast Mode' when taking these supplements."

❁❁❁

**Maternal health in India much worse than previously thought**
5 March 2015 Medical News Today

More than 40 percent of women in India are underweight when they begin pregnancy, according to a new study published by Princeton University's Woodrow Wilson School of Public and International Affairs. On average, these women gain only 15 pounds throughout pregnancy - just half of the recommended amount.

The findings - featured in the Proceedings of the National Academy of Sciences (PNAS) - are a concern as body mass and weight gain during pregnancy are important indicators of maternal health. Babies born to undernourished mothers are more likely to be underweight, a characteristic influencing height, cognition and productivity across a lifetime.

The study also drew surprising comparisons with sub-Saharan Africa, a region known for extremely poor health with high birth rates. In the end, Indian women fared worse; only 16.5 percent of women in sub-Saharan Africa are underweight before pregnancy.

The results highlight the need for government-backed support with regards to maternal health monitoring throughout pregnancy. While feasible, improving maternal nutrition in India may be an uphill climb because, as the research reports, the health of pregnant women is often compromised by their low social position in Indian households.

"These findings should be a wake-up call about maternal nutrition in India," said lead author Diane Coffey, a Ph.D. student at the Wilson School's Center for Population Research. "The health of children is one of the most important measures of the wellbeing of a society, and that starts during pregnancy. India must invest more in its most important resource: human capital formed at the very beginning of life."

In 2012, Coffey -who is a co-founder of the research institute for compassionate economics (r.i.c.e.), a non-profit in India - conducted a qualitative study about the health mothers and infants in three Indian villages. She soon began noticing a pattern: mothers were not gaining weight at the expected rates. Coffey decided to investigate this behavior on a larger scale by looking at maternal health across India.

Coffey found that unlike the United States, where the Centers for Disease Control and Prevention monitors health in pregnancy, there is no national health monitoring system in India. As a result, prior studies of maternal health in India have severely missed the mark when calculating pre-pregnancy body weight.

The most recent maternal health data was collected in 2005 by the Demographic and Health Survey, which showed that 35.5 percent of women aged 15 to 49 are underweight. While this figure is commonly cited, it is actually inaccurate, Coffey reports, as women who become pregnant are different from those who do not with regards to body mass.

Using a variety of econometric strategies, Coffey estimated the pre-pregnancy body mass and weight gain during pregnancy in India and sub-Saharan Africa. Using reweighting techniques to correct body mass index scores (BMI), she finds that the average BMI of pre-pregnant women in India is 19.5 percent and the fraction of women who begin pregnancy underweight is 42.2 percent. This is almost 7 percentage points higher than the fraction of underweight women between ages 15 and 49.

"These findings point to the need for a national health monitoring system," said Coffey. "That way we wouldn't need to rely on outdated cross-sectional surveys to estimate these important indicators of maternal health."

The research also computes pre-pregnancy BMI and underweight women in sub-Saharan Africa. In sub-Saharan Africa, people are poorer and fertility rates are higher than in India. And yet, maternal nutrition indicators in sub-Saharan Africa suggest better maternal health. Coffey's reweighting analysis found that only 16.5 percent of women there are underweight before pregnancy, and the average pre-pregnancy BMI is 2 points higher than women in India, at 21.5.

One commonality is that women gain only 15 pounds on average in both regions, just half of what is recommended by the U.S. Institute of Medicine. Still, while women in both regions gain similar amounts of weight, Indian women weigh much less when beginning pregnancy - putting them at a severe deficit from the start.

That maternal health in India is so poor seems puzzling considering its economic successes, but past social scientific and epidemiological literatures offer some clues. It is widely recognized that the status of women in India is much worse than in sub-Saharan Africa. In India, young, newly married women are at the bottom of household hierarchies and have even lower status than older women. Sex ratios in sub-Saharan Africa are a bit more balanced, and the sex gaps in education, work outside the home and child mortality are not as large.

"Throughout India, pregnant women and their babies suffer the consequences of living in a deeply patriarchal society," Coffey said. "Young, newly married women, who are the most likely to become pregnant, are often expected to keep quiet, work hard and eat little."

In addition to having low social status, these women live in exceptionally poor disease environments. Around 70 percent of rural Indian households defecate in the open, a practice that spreads intestinal diseases and parasites, making it difficult for people to use the energy and nutrients food. It is likely that infectious disease is responsible for a significant proportion of India's pre-pregnancy underweight problem, Coffey concludes.

Addressing India's abysmal maternal health outcomes with government policy will not be easy. Current maternal health programs, such as the distribution of free food and cash incentives for hospital deliveries, do not focus on weight during pregnancy and have little effect on neonatal mortality. Reducing the disease burden by reducing open defecation is extremely challenging because, due to villagers' ideas about purity, pollution and caste, most people reject affordable latrines.

"An important first step to improving pregnancy outcomes would be for the government to monitor maternal health by tracking a sample of women throughout their pregnancies. Sample surveys are quite feasible in India - they were in a sense invented in India - the only hard part is the government choosing to do it." Coffey said. "A national monitoring system would allow policy makers to see how maternal health changes over time and to see whether new programs make a difference."

❁❁❁

**Omega-3 fatty acids appear to protect damaged heart after heart attack**
9 March 2015 Medical News Today

**Study suggests this therapy may provide added benefits to standard care**

Taking omega-3 fatty acids appeared to lower inflammation and guard against further declines in heart function among recent heart attack survivors already receiving optimal standard care, according to results from a randomized, controlled trial to be presented at the American College of Cardiology's 64th Annual Scientific Session in San Diego.

Patients in the study taking 4 grams of prescription-only omega-3 fatty acid capsules daily for six months after a heart attack were significantly more likely to show improvements in heart function compared to patients taking a placebo. Heart function was measured by an expansion of the left ventricular endsystolic volume index. Patients taking omega-3 fatty acids also had significantly less evidence of fibrosis -- a thickening or scarring of the areas of the heart remote from the heart attack, which can develop when the surviving heart muscle works harder and under high pressure to compensate for the damage to the heart. The data suggests that patients who were able to mount a substantial change in levels of omega-3 fatty acids in their blood derived the most benefit.

"Giving a high dose of omega-3 fatty acids soon after a heart attack appears to improve cardiac structure and heart functioning above and beyond the standard of care," said Raymond W. Kwong, M.D., M.P.H, director of cardiac magnetic resonance imaging at Brigham and Women's Hospital in Boston and the study's senior author. "Because this is a unique group of patients with remarkably high adherence to [guideline-directed] treatments for acute myocardial infarction already, we feel fairly confident that the benefits from this therapy are additive. The implications of this study could be fairly large."

An estimated 720,000 Americans have heart attacks each year. After a heart attack, the heart can remodel or reorganize itself to maintain or improve function. In some cases, the heart may undergo adverse changes such as enlargement of the heart, decreased pumping ability or added cardiac strain that can predispose someone to heart failure and arrhythmias later in life.

Although earlier studies have shown that omega-3 fatty acids may lower the risk of irregular heartbeats and death from a heart attack, research has not consistently shown a benefit. Kwong said his research is the first to use quantitative cardiac imaging to look at how omega-3 fatty acids might actually protect the heart after a major heart attack.

Researchers randomized 374 patients recovering from a heart attack and receiving standard treatment to take either 4 grams of omega-3 fatty acids or a placebo; groups were balanced in terms of location of the infarct--anterior or non-anterior--and age. Blood work and cardiac imaging were analyzed at two to four weeks post-heart attack and again at six months. Compared to previous research, this study used a much higher dose of omega-3 fatty acids, 4 grams compared to 1 gram daily, and a small amount of corn oil, which does not contain fatty acids, as the placebo.

By using cardiac magnetic resonance imaging, researchers were able to look at changes in patients' hearts and see the disease process before and after treatment. Adverse changes in left ventricular remodeling and function, in addition to the worsening of fibrosis, were used as surrogates for poor outcomes after heart attack.

Patients taking the omega-3 fatty acids were 39 percent less likely to show a deterioration of heart function as compared to patients taking a placebo. The analysis also looked at key markers of systemic inflammation, which were also more likely to be improved in those taking the fish oil. In particular, the percent reduction in ST2, a marker of the severity of adverse cardiac remodeling and tissue fibrosis, was substantially greater in the treatment arm after six months.

"Omega-3 fatty acids may have anti-inflammatory effects and also promote better cardiac healing," Kwong said. "This is important because other anti-inflammatory agents, including steroids and NSAIDS, have failed to make a difference after myocardial infarction." Patients in the study who had a 5 percent increase in the amount of omega-3 fatty acid in their blood seem to have the best chance of improving heart function.

"If this becomes a useful therapy, it seems a 5 percent increase in the serum level of omega-3 fatty acids correlates with a 10 percent improvement in left ventricular remodeling," he said. In this study, most (92 percent) of patients randomized to fish oil increased omega-3 fatty acid by at least 5 percent, compared with less than half (42 percent) of patients receiving placebo.

Kwong said the higher-dose omega-3 fatty acids was not found to be associated with any major safety issues, such as increased bleeding. "It's a very well-tolerated therapy," he said, adding that it is unlikely patients could get the amount of omega-3 fatty acids from diet alone. He said the daily 4 gram dose is roughly equivalent to someone eating a large, 8-ounce serving of salmon every day for six months.

For many years, the American College of Cardiology and the American Heart Association have recommended that people eat fish rich in omega-3 fatty acids at least twice a week because of its potential heart benefits.

Kwong said most North Americans do not follow this advice, while Japanese populations with higher levels of omega-3 and an otherwise similar risk profile to North Americans have lower risks of heart disease and sudden cardiac death. The increase in the omega-3 blood content of many patients in Kwong's study at six months was similar to levels found in Japanese populations with a diet very rich in omega-3 fatty acids.

Fatty fish such as salmon, tuna, trout and sardines contain the most omega-3 fatty acids. Fatty acids are a key component of cell membranes and they help with cell signaling, proper immune function and may also improve cognitive functioning. This study is limited in that it did not investigate the association between omega-3 fatty acids and cardiac events after heart attack; assessing this relationship would require a large group of patients over many years. It also did not evaluate this treatment immediately after having a heart attack.

❁❁❁

**'Love hormone' nasal spray could reduce calorie intake in men**
9 March 2015 Medical News Today

A study has found that a single dose of nasal spray containing the hormone oxytocin led to reduced caloric intake in healthy men. In particular, the synthetic nasal formulation reduced the consumption of fatty foods.

Previous research has suggested that oxytocin is involved in appetite-reducing pathways in the brain.

The findings were presented at the 97th annual meeting of the Endocrine Society and confirmed the findings of previous animal studies demonstrating that oxytocin reduces food intake. "Our results are really exciting," says lead investigator Dr. Elizabeth Lawson of Harvard Medical School in Boston, MA. "Further study is needed, but I think oxytocin is a promising treatment for obesity and its metabolic complications."

As well as reducing the number of calories that men consumed at a subsequent breakfast, the oxytocin nasal spray also improved certain metabolic characteristics such as insulin sensitivity - the body's ability to clear glucose from the bloodstream.

Oxytocin is widely referred to as "the love hormone" due to its association with parts of the brain involved in emotional, cognitive and social behaviors. Acts of intimacy, such as sexual intercourse and holding hands, stimulate the release of oxytocin in both men and women.

Experts have also demonstrated that oxytocin interacts with the same reward system that many drugs taken to produce euphoria act upon. This system is driven by the neurotransmitter dopamine. While the oxytocin nasal spray used in the study has been approved for use in Europe, in the US, it can only be used in clinical trials. Oxytocin is, however, available for use in the US as a drug to induce labor.

**Fewer calories consumed on average after using nasal spray compared with placebo**

For the study, the researchers randomly assigned 25 healthy men with an average age of 27 to take a dose of either oxytocin nasal spray or a placebo after fasting. While otherwise healthy, 12 of the participants were overweight or obese and 13 had a healthy weight.

One hour after self-administering their treatment, the participants were served a breakfast of their choice, selected from a menu. Each meal option contained double portions, and after the meal was finished, the researchers measured how many calories each participant had consumed. The participants then returned at a later date, and the experiment was repeated, with each participant receiving the opposite treatment to that they had previously received. In the 3 days preceding each experiment, the participants reported eating the same amount of food.

**On average, the researchers found that the men ate 122 fewer calories and 9 g less fat at the meal after administering a dose of the oxytocin nasal spray in comparison with the placebo. The oxytocin nasal spray also appeared to increase the use of body fat as a fuel for energy.**

The spray did not affect the participants' self-reported appetites or the levels of appetite-regulating hormones found in their bloodstreams. The researchers are, therefore, unsure precisely how the oxytocin affected the men's caloric intake.

Although the treatment that the participants received was randomized, the study is limited by its relatively small number of participants, its short testing duration and its observational nature, meaning that the researchers cannot determine the causes of their findings.

Dr. Lawson states future research will need to examine the effects of the nasal spray among women, as oxytocin has been demonstrated to have sex-specific effects. The effects of the nasal spray should also be tested for an extended treatment duration. Recently, Medical News Today reported on a study suggesting that oxytocin may have a sobering effect against alcohol.

❁❁❁

**Regular Black Tea May Be Relevant For Cardiovascular Protection**

Food Navigator USA 19-Feb-2015
**Black tea may help lower blood pressure for people with elevated levels, says a new study from Unilever R&D that adds to the potential health benefits of the beverage and its constituents.**

Two cups of black tea per day for eight days were associated with significant improvements in arterial stiffness, and decreases in systolic and diastolic blood pressure, report researchers from the University of L'Aquila in Italy and Unilever R&D in Vlaardingen, The Netherlands.

“We observed for the first time that black tea, naturally rich in flavonoids, counteracted or completely prevented the abnormalities in peripheral arterial hemodynamics that were caused by an acute oral fat load in never-treated hypertensive patients,” they wrote in Nutrients .

“It is important to note that while our study design was rigorous, it was also short-term and included a small number of subjects. A review of epidemiological and mechanistic studies suggests that flavonoids from

different sources manifest beneficial effects on the cardiovascular system. Several lines of clinical and experimental evidence also indicate that tea may help to reduce cardiovascular disease risk by improving endothelial function and decreasing BP levels.

"This may significantly contribute to the cardiovascular disease incidence, when one considers that tea is globally the most consumed beverage after water."

**Tea facts**
Interest in tea and its constituents has bloomed in recent years, with the greatest focus on the leaf's polyphenol content. Green tea contains between 30 and 40% of water-extractable polyphenols, while black tea (green tea that has been oxidized by fermentation) contains between 3 and 10%. Oolong tea is semi-fermented tea and is somewhere between green and black tea.

Most of the studies have focused on green tea and its constituents, most notably EGCG. Unilever, however, has focused a lot of R&D on the potential health benefits of L-theanine, an amino acid found in tea leaves that is thought to help reduce stress, promote relaxation and improve the quality of sleep, and theaflavins, which are compounds unique to black tea.

**Study details**
Led by Davide Grassi, the researchers recruited 19 people with elevated blood pressure to participate in their randomized, double-blind, controlled, cross-over study. Volunteers were randomly assigned to either consumer two cups of black tea per day (providing a flavonoid dose of 129 milligrams per cup) or placebo for eight days. The tea was consumed without sugar, milk, lemon or any other additives. They then underwent a 13 day washout period before crossing over to the other group.

Results showed that black tea was associated with reductions in the reflection index and stiffness index, both of which are measures of arterial health. In addition, black tea was associated with 3.2 mmHg and 2.6 mmHg reductions in systolic and diastolic blood pressure, respectively. Black tea consumption also prevented increases in blood pressure after consuming a high fat meal, said Grassi and his co-workers.

"From a public health point of view, avoiding to suggest black tea consumption as a ticket to consume high-fat diets, these findings may be of relevance: the tested tea dose of 1 (acute) or 2 cups (per day) was moderate and the intervention time relatively short," wrote the researchers. "Moreover, the average energy intake in this study of 824 kcal mimicked a serving size typical for the main meal in Western diets."
❁❁❁

**Alpha-lipoic Acids + EPA May Promote Body Weight Loss in Healthy Overweight Women**

Nutra Ingredients USA, 27-Feb-2015

**Supplements of alpha-lipoic acid, with or without EPA omega-3, may help promote weight loss in obese and overweight women on a reduced calorie diet, says a new study from Spain.**

Alpha-lipoic acid supplements enhanced weight loss in the women, compared to the reduced calorie diet alone, according to a study with 77 women published in Obesity. Adding EPA to the supplementation regime was found to counter the reductions in levels of leptin (the satiety hormone) that occur during weight loss, said scientists from the University of Navarra.

"Our data suggest that alpha–lipoic acid supplementation at a dose of 300 mg/day combined with an energy-restricted diet might help to promote weight loss and fat mass reduction in healthy obese women," they wrote. "Although EPA supplementation did not have any additional effect on the reduction of body and fat mass, it prevents the fall of leptin during weight loss."

**Anti-obesity properties**

Alpha-lipoic acid, a naturally occurring antioxidant and co-factor for mitochondrial enzymes, has been reported to have potential anti-obesity properties, such as reducing body weight and fat, and boosting satiety.

"However, studies in humans with alpha-lipoic acid supplementation are limited and with controversial outcomes, and it is difficult to reach firm conclusions regarding the proper dose and its potential role in the treatment of obesity," explained the researchers.

To expand current knowledge in this area the researchers recruited 97 overweight and obese women to participate in their short-term double-blind placebo-controlled study. All of the women were prescribed a reduced calorie diet, and divided into four groups: Control (no supplements); EPA only (1.3 grams per day, provided by Solutex); alpha-lipoic acid only (0.3 grams per day, Nature's Bounty), or EPA + alpha-lipoic acid for ten weeks. Seventy-seven women completed the study.

Results showed that the control group lost an average of 5.2 kg on the reduced calorie diet. Similar weight loss was seen in the EPA only group (5.4 kg), while the alpha-lipoic acid only group lost significantly more (an average of 7 kg). The EPA + alpha lipoic acid group lost an average of 6.5 kg, but this difference was not statistically significant compared to the control.

Leptin levels were found to decrease in the control and alpha-lipoic acid only group, but these reductions were attenuated when EPA was also consumed, said the researchers. Commenting on the potential mechanism, the researchers rejected a role for increased satiety from alpha-lipoic acid since leptin levels decreased unless EPA was also consumed, and because there were no differences in energy intake between the groups.

"Adipose tissue is a target organ whereby alpha-lipoic acid exerts its anti-adiposity effects by inhibiting lipogenesis, increasing lipolysis and inhibiting adipogenesis," wrote the researchers. "Therefore, these mechanisms could be also contributing to the body weight- and fat mass-lowering actions of alpha-lipoic acid, without necessarily involving an increment of energy expenditure. It is essential that these observations be further explored and the underlying mechanisms better elucidated," they concluded.

❁❁❁

**3-5 Cups of Coffee a Day May Help Keep Artery Blockages Away**

03-Mar-2015 Nutra Ingredients USA

**People who consume between three to five cups of coffee a day may have a lower risk of coronary artery calcium build-up, which can lead to artery blockages, according to research published in the British Medical Journal's publication Heart.**

Coronary artery calcium, or calcification, is an early indicator of coronary atherosclerosis whereby fatty material is accumulated narrowing the arteries and increasing the risk of blood clots and therefore heart attack. The study looked at 25,138 Korean male and females with an average age of 41.3 years and no clinical signs of cardiovascular disease.

A U-shaped association was found between coffee consumption and a lower prevalence of coronary artery calcium, with this risk being lowest amongst the three to five cup group. In their conclusions the researchers from the Sungkyunkwan University in South Korea, Johns Hopkins Bloomberg School of Public Health in the US and the University of Malaya in Malaysia wrote: "Our study adds to a growing body of evidence suggesting that coffee consumption might be inversely associated with cardiovascular disease risk. Further research is warranted to confirm our findings and establish the biological basis of coffee's potential preventive effects on coronary artery disease."

The participants completed a 103-item dietary survey in which they were asked how often on average they had consumed each type of food and drink during the previous year. They also gave details of portion size

(small, medium or large) and frequency (ranging from never, seldom and more than three times a day for foods and never, seldom and more than five times a day for beverages).

However the British Heart Foundation (BHF) warned against generalising these results since they were based on a South Korean population, which differed in diet and lifestyle habits from people in the Europe. Victoria Taylor, senior dietitian for the charity, said: "While this study does highlight a potential link between coffee consumption and lower risk of developing clogged arteries, more research is needed to confirm these findings and understand what the reason is for the association."

The researchers behind this latest research said findings around cardiovascular health and coffee intake had been controversial with results veering from an increased risk of cardiovascular disease to a decreased risk with moderate consumption. This earlier meta-analysis had also pinpointed this three to five cup consumption as a moderate daily coffee intake.

❁❁❁

**Catechins, but not Quercetin, Behind Some of Cocoa & Tea's Benefits**

02-Mar-2015 Nutra Ingredients USA

**Supplementation with epicatechin may beneficially affect insulin levels and insulin resistance, but another flavonoid quercetin had no effect, says a new study from The Netherlands.**

Epicatechin is found in flavonoid-rich foods such as cocoa and tea, and has been linked to a range of health benefits, including cardiovascular health. Quercetin is a flavonoid found in fruits and vegetables, and data from in vitro or animal studies have also linked the compound to cardiovascular benefits. Data from human studies is rare, however.
Supplements of epicatechin or quercetin were found to produce different results in healthy men and women, with only
epicatechin showing improvements in insulin levels and insulin resistance, according to findings published in the American Journal of Clinical Nutrition .

On the other hand, neither compound was found to have an effect on blood pressure, blood flow, or any other risk factors for cardiovascular disease, report researchers from the Top Institute Food and Nutrition, Wageningen University, and Unilever R&D Vlaardingen.

"Our findings suggest that epicatechin plays a role in the beneficial effects of cocoa and tea on insulin resistance," they wrote. "No effects of epicatechin were seen on endothelial function or other markers of cardiometabolic health.
Quercetin, a major flavonol in tea, did not influence any of the markers of cardiometabolic health. It is unlikely; therefore, that quercetin plays a role in the cardioprotective effects of tea."

**Study details**
The researchers, led by Peter Hollman from Wageningen University, recruited 37 healthy men and women with an average of 66 and an average BMI of 26.7 kg/m2 to participate in their randomized, double-blind, placebo-controlled crossover trial. Participants were randomly assigned to receive placebo, 100 mg per day of (−)-epicatechin, or 160 mg per day of quercetin-3-glucoside for four weeks. Each intervention was followed by four week 'washout' period before crossing over to another intervention.

Results showed that epicatechin affected insulin levels and insulin resistance, measured using the homeostasis model (HOMA-IR). "Epidemiologic studies have shown an association between HOMA-IR and CVD risk," explained the researchers. "In our study, the reduction in mean HOMA-IR of -0.38 following epicatechin supplementation was smaller than that of the cocoa meta-analysis [Hooper et al. Am J Clin Nutr 2012, Vol. 95, pp. 740-51].

"Our study population had a mean HOMA-IR of 1.57, which is below the threshold of insulin resistance. The response to epicatechin may be stronger in subjects with impaired fasting glucose concentrations and higher levels of insulin resistance. The results of the present study suggest that epicatechin contributes to the favorable effects seen in cocoa trials." No effects were observed on insulin measures for quercetin, while neither compound resulted in changes to other measures of cardiovascular health.

❁❁❁

**Daily Coffee Polyphenols Can Reduce Diabetes Risk, Say Japanese Researchers**

04-Mar-2015 Nutra Ingredients USA

**Japanese researchers have found coffee polyphenols can reduce type 2 diabetes risk via an insulin-regulating intestinal peptide.**

Following other animal and human studies that highlighted a beneficial link between coffee and diabetes, the Kao Corporation scientists hypothesised that the glucagon-like peptide 1 (GLP-1) was pivotal in the biological process. "The present results suggest that polyphenols from coffee may serve as an exogenous physiological regulator of the secretion of incretin with an influence on blood glucose homeostasis," the researchers concluded.

"This may be important for the further development of GLP-1-based therapies for the treatment of diabetes." In the mouse study they found that a coffee polyphenol extract (CPE) induced GLP-1 secretion and decreased postprandial hyperglycaemia, which led them to suggest the ingestion of CPE may improve insulin sensitivity and therefore reduce the likelihood of diabetes 2 setting in.

❁❁❁

**Glucosamine-Chondroitin Combination Shows Anti-Inflammatory Potential: RCT Data**

11-Mar-2015 Nutra Ingredients USA

**A combination of glucosamine hydrochloride and chondroitin sulfate may slash levels of C-reaction protein (CRP), a key biomarker of inflammation, says a new randomized, double-blind, placebo-controlled, crossover study.**

Data showed the combination of FCHG49 glucosamine hydrochloride and TRH122 chondroitin sulfate reduced CRP levels by an impressive 23%, compared to placebo. The glucosamine-chondroitin combination was also associated with significant reductions in the 'cytokine activity' pathway, compared to placebo, according to findings published in PLoS One .

"Glucosamine and chondroitin supplementation may lower systemic inflammation and alter other pathways in healthy, overweight individuals," wrote the researchers. This study adds evidence for potential mechanisms supporting epidemiologic findings that glucosamine and chondroitin are associated with reduced risk of lung and colorectal cancer."

**Healthy and not so healthy**

The joint health market is dominated by glucosamine and chondroitin. Amongst the most important studies supporting the apparent benefits of the ingredients was the $14 million Glucosamine/chondroitin Arthritis Intervention Trial (GAIT), sponsored by the National Institute of Health, which studied the effects of the supplements in 1,583 people with osteoarthritis

The results, published in the prestigious New England Journal of Medicine (2006, Vol. 354, pp. 795-808), indicated that the combination of glucosamine and chondroitin sulfate "significantly decreased" knee pain for people suffering from moderate-to-severe osteoarthritis.

The new study, led by Dr Sandi Navarro, PhD, is said to be the first randomized trial to evaluate the effects of glucosamine and chondroitin on inflammation in healthy adults. According to the researchers, the reduction observed in CRP levels may help to explain the findings of the VITAL (VITamins and Lifestyle) study , a large prospective epidemiological study also conducted at Fred Hutchinson Cancer Research Center, which found that participants who were users of glucosamine and chondroitin had a lower risk of certain health conditions.

"We designed our trial as a follow-up to VITAL, as we were intrigued by the findings associated with the glucosamine/chondroitin combined supplementation," said Dr Navarro. "We are pleased to have identified a possible biologic mechanism to support those findings."

**Study details**
The researchers recruited 18 healthy overweight men and women and randomly assigned them to receive a combination of glucosamine hydrochloride (1,500 mg/day) and chondroitin sulfate (1,200 mg/day) or placebo for 28 days. Results showed that CRP levels were reduced by an average of 23% after glucosamine/chondroitin, compared to placebo.

"Our results are consistent with observational studies reporting an association between glucosamine and chondroitin and circulating concentrations of CRP," added Dr. Navarro. "A major strength of this study is that participants were healthy and free of underlying conditions that might have affected the results."

Analysis of gene set enrichment also found that cytokine activity and other inflammation-related pathways were significantly decreased after the glucosamine/chondroitin supplementation period. "Thus, there is now growing evidence that glucosamine and chondroitin reduce systemic inflammation in humans," wrote the researchers in PLoS One. "Future studies in larger samples and other populations are needed to determine the potential utility of glucosamine and chondroitin as a possible anti-inflammatory agent."

The results were welcomed by Dr Brian Cornblatt, medical director of Nutramax Laboratories, which supplied the FCHG49 glucosamine hydrochloride and TRH122 chondroitin sulfate joint health supplement used in the study. "To my knowledge, the Fred Hutch study is the first to directly demonstrate a statistically significant reduction in high-sensitivity CRP following daily consumption of glucosamine and chondroitin sulfate, in a controlled trial," said Dr Cornblatt. "The results, which were evident after only 28 days, further support what we have been observing in our laboratory research."
❁❁❁

**Heat-Killed Bacteria May Offer Immune Support for the Elderly**

03-Mar-2015 Nutra Ingredients USA

**Supplements containing heat-killed Lactobacillus gasseri TMC0356 bacteria may enhance the immune systemof older people and protect them from infection, says a new study from Japan.**

Over 60% of immune health measures decreased during the winter months of the study in the placebo group, report scientists from Takanashi Milk Products Ltd report in Beneficial Microbes , but only 32% decreased in the TMC0356 group, and none of those were statistically significant.

In addition, the heat-killed bacteria group displayed increases in CD8+ T lymphocytes, a well-established diagnostic measure of immune system functioning. Lymphocytes are white blood cells that play a key role in immune response, and CD8+ refers to the presence of certain receptors on the surface of the cells.

"These results indicate that TMC0356 may positively alter human immune response," wrote the researchers, led by Fang He, PhD, deputy manager of technical research at Takanashi Milk Products Co. "Considering that subjects who participated in the study were healthy before its commencement, the lack of significant change in the immune indexes can be considered as good evidence that TMC0356 treatment is safe."

**Definition**
Although the strain seems to be beneficial it is not defined as probiotic because it is heat-killed, and not live. According the FAO/WHO, probiotics are defined as "live microorganisms which when administered in adequate amounts confer a health benefit on the host".

Other Japanese companies are researching the potential health benefits of heat-killed bacteria. In 2012, scientists from Tokyo Metropolitan Institute of Gerontology and Otsuka Pharmaceutical Company Limited reported that daily intakes of heat-treated Lactobacillus pentosus strain b240 were associated with a 39% reduction in the incidence of the common cold , compared to placebo.

That report, published in the British Journal of Nutrition, was said to be the "first to show that oral intake of heat-killed lactic acid bacteria dose-dependently reduces the incidence rate of the common cold in elderly adults."

**New data**
The researchers recruited 28 healthy people aged between 50 and 70 to participate in their double-blind, placebo-controlled clinical study. Participants were randomly assigned to receive supplements containing L. gasseri TMC0356 (one billion colony forming units per day) or placebo for four weeks. Results showed that the number of CD8+ T cells increased by 13.7% in the TMC0356 group, while these decreased by 1% in the placebo group.

In addition, the population of CD8+CD28+ T cells was found to decrease significantly in peripheral blood mononuclear cells from the placebo group, which indicated that expression of CD28+ was partly impaired. "Notably, this [impairment of CD28+ expression] is considered as one of the important aspects of age-associated immune-senescence in humans," wrote the researchers.

However, no such decreases were observed in the TMC0356 group. "These results indicate that TMC0356 may protect host animals from the loss of CD28 expression, and this alleviate age-associated immune senescence. Furthermore, our results may provide insights into the underlying mechanisms of TMC0356 immunity enhancement observed in previous studies. "The effect of TMC0356 on immune responses in the elderly may enhance their natural defence mechanisms against pathogenic infections," they concluded.

❁❁❁

**Meta-analysis Rejects Safety Concerns Over Calcium Supplementation for Increasing Coronary Heart Disease Risk**

26-Feb-2015 Nutra Ingredients USA

**Elderly women who take calcium supplements to fill their dietary gap of the nutrient are not an increased risk of coronary heart disease or all-cause mortality risk, says a new meta-analysis from an international team of researchers.**
Writing in the Journal of Bone and Mineral Research, the researchers noted that the effects were observed with or without vitamin D supplementation. However, the evidence is currently insufficient to support a lack of effect in men and younger women.

"The findings that calcium supplementation with or without vitamin D in elderly women did not increase coronary heart disease or all-cause mortality or the separate secondary outcomes of myocardial infarction, angina and acute coronary syndrome, and chronic coronary heart disease verified by clinical review, hospital record, or death certificate are reassuring," wrote the researchers, led by Joshua Lewis from Sir Charles Gairdner Hospital Unit in Perth, Australia. The other authors were affiliated with Aarhus University Hospital (Denmark), University of Sydney (Australia), Creighton University (USA), and the Fred Hutchinson Cancer Research Center (USA).

**Bone health and heart health**

Osteoporosis has been described as a silent killer, and recent data from the National Osteoporosis Foundation showed that approximately 9 million American adults currently have osteoporosis and another 48 million have low bone mass, placing them at increased risk.

An economic report from Frost & Sullivan and commissioned by the Council for Responsible Nutrition (CRN) recently found that supplements of calcium plus vitamin D for all US women with osteoporosis could provide healthcare cost savings of $1.08 billion per year.

Despite the clear benefits of calcium (and vitamin D) for bone health, papers published in journals such as JAMA , Heart , and the British Medical Journal found significant adverse cardiovascular effects related to excessive calcium intake in different populations, leading to concerns, and even condemnation of calcium supplements by some.
The plaques that form in diseased arteries are composed mostly of calcium, and some researchers have postulated that this is directly related to the rapid spiking of blood calcium levels following ingestion of the supplement.

**Sales slump**
The literature, however, is contradictory, with data published in the American Journal of Clinical Nutrition concluding that current evidence does not support the notion that calcium supplements increase the risk of heart disease in elderly women. Sales of calcium supplements have been affected by the controversy. Dollar sales of calcium/calcium formula supplements declined 6.9% versus previous year's sales, according to SPINS. There is positive news from the natural supermarkets, however, with growth of 1.5% year-on-year.

**Meta-analysis details**
Lewis and his co-workers pooled data from 18 randomized clinical trials including 63,563 participants with 3,390 coronary heart disease (CHD) events and 4,157 deaths. Data from five trials indicated that calcium supplementation did not increase the risk of CHD events, while data from 17 trials found no overall effect on all-cause mortality In addition, no significant effects were found for heart attack risk, angina, or chronic CHD.

"Although food-derived calcium is the optimal source to achieve the recommended dietary intake (RDI) of calcium, in cases where this RDI cannot be reached from food sources alone the use of long-term calcium supplementation with vitamin D in older women should be considered, given the beneficial effects on falls, bone mineral density and fracture outcomes, and all-cause mortality," wrote the researchers.

"However, given the uncertainty by patients and clinicians alike, further large well-designed randomized controlled trials of calcium supplementation with vitamin D that include bone and verified cardiovascular outcomes are urgently needed to address this issue."

**Vitamin K**
Industry sources have also noted that nutrition savvy dietitians would not recommend calcium in isolation, but in combination with other nutrients. One nutrient gaining more attention is vitamin K. A recent paper published in Thrombosis and Haemostasis indicated that long-term supplementation with vitamin K2 may inhibit age-related stiffening of the artery walls in healthy postmenopausal women.

A daily 180 microgram dose of NattoPharma's MenaQ7 vitamin K2 for three years was also associated with statistically significant improvement of vascular elasticity. "This is the first study showing that long-term use of vitamin K2 in the form of MK-7 beneficially affects cardiovascular health," said Cees Vermeer, Chief Innovation Officer at the R&D Group VitaK of the Maastricht University Holding (The Netherlands), and lead researcher on the study.

"The women taking the MenaQ7 vitamin K2 did not experience the typical age-related progression of arterial wall stiffening, and even made a statistically significant improvement of vascular elasticity, compared to the placebo group," he added. "Our data demonstrated that a nutritional dose of vitamin K2 in fact improves cardiovascular outcomes."
❁❁❁

**New Prebiotic May Boost Flu Vaccine Effects in the Elderly**

09-Mar-2015 Nutra Ingredients USA

**Supplements containing a combination of a new prebiotic called bifidogenic growth stimulator (BGS) and an established prebiotic (galactooligosaccharide) may enhance the effects of the flu vaccine, says a new study from Japan.**

Elderly people fed the prebiotic combination displayed enhanced immunological responses after receiving a flu vaccine, compared to the control group. Scientists from Nagoya City University Graduate School of Medical Sciences, Fukushimura Hospital, the National Center for Geriatrics and Gerontology, and Meiji Co., Ltd report their findings in the journal Geriatrics & Gerontology International.

"The present study suggests that the simultaneous administration of different types of prebiotics, GOS, BGS and fermented milk products, could facilitate the maintenance of the enhanced antibody titers against the influenza vaccine in elderly subjects," they wrote. "However, these results were obtained with only a small cohort of participants, and further studies will be required to elucidate these effects of the prebiotics."

**Definitions**

Prebiotics are defined as "non-digestible substances that provide a beneficial physiological effect on the host by selectively stimulating the favorable growth or activity of a limited number of indigenous bacteria". The prebiotic potential of galactooligosaccharides (GOS) has been reported many times in the literature, but BGS is less well-established. "[BGS] was discovered from a culture of the Propionibacterium freudenreichii ET-3 strain," explained the researchers.

"This culture encourages the Bifidobacterium growth activity by effectively converting nicotinamide adenine dinucleotide hydride (NADH) into nicotinamide adenine dinucleotide (NAD) during carbohydrate metabolism. This new prebiotic was purified and named bifidogenic growth stimulator (BGS). Because GOS, BGS and the prebiotics in Fibren-YH represent different types of prebiotics, it is hypothesized that the combinational administration might effectively stimulate intestinal, endogenous, protective bacteria growth and might enhance antibody titers against the influenza vaccine in a synergistic manner, exceeding the benefit of each probiotic alone, and it is expected that the enhanced immune response can be obtained in clinical studies."

**Study details**

With that rationale, the researchers recruited 30 elderly subjects being fed enterally with Meiji's Fibren-YH formula, and randomly assigned them to one of two groups: To receive the formula only, or to receive the additional combination with GOS (4.0 grams per day) and BGS 0.4 grams per day) for 10 weeks.

Flu vaccines were administered at the four week point. Results showed that Bifidobacterium fecal counts increased from week four to week 10 in the prebiotic group, but decreased in the control group. In addition, Bacteroides counts increased in the prebiotic group, but decreased in the control group. To assess the response to the vaccination, antibody titers against the H1N1, H3N2 and B antigens were measured. The data indicated that all titers increased in both groups at week six (two weeks after vaccination), but these levels subsequently decreased in the control group, with the titers at week 10 not significantly different from those at week 4. On the other hand, "all antibody titers in [the prebiotic group] at week 10 were significantly higher than those at week 4", said the researchers.

"The present study suggests that the simultaneous administration of the different types of prebiotics might facilitate the maintenance of the enhanced antibody titers in elderly subjects receiving enteral nutrition," they wrote. "With respect to the involvement of the intestinal microbiota in the host immune system, it has been recently shown that Bacteroides species have beneficial effects on the host immune system. Bacteroides fragilis produces capsular polysaccharide A, and polysaccharide A modulates the host immune system in ways that benefit the host. Based on these studies, the immunological response enhanced by the prebiotics in the present study would be interesting. Further studies are required to clarify the involvement of the Bacteroides by these prebiotics."

❁❁❁

**Researchers Delve Into Nutrition Solutions for Illness-prone Athletes**

27-Feb-2015 Nutra Ingredients USA

**There is a need for greater research into nutrition solutions for upper respiratory tract infections (URTIs) that are common in athletes, according to the researcher behind a study on the impact of omega-3, vitamin D and protein supplementation.**

Training schedules, poor nutrition, lack of sleep, stress and consequently impacted immune systems were all factors that meant athletes were more susceptible to URTIs. Speaking with NutraIngredients, senior lecturer in exercise physiology at the University of Aberdeen Dr Stuart Gray said previous research had suggested marathon runners were up to twice as likely to contract an URTI before and after the event – an association that had even been correlated to the number of miles run per week.

The term URTI covers illnesses caused by infection of the upper respiratory tract – the nose, sinuses, pharynx or larynx – and can include things like tonsillitis, pharyngitis, laryngitis, sinusitis, otitis media (inflammation of the middle ear) as well as the common cold.

Gray - who has just published his own research on the subject in the journal International Journal of Sports Medicine - told us such infections were a source of concern for serious athletes. "From an elite athlete point of view it is something they do worry about a lot. They're quite paranoid about this and they are very hygiene conscious, they always shower with flip-flops on and alcohol swab their hands before touching the toilet seats and that kind of thing because they are very paranoid about coming down with a cough and a cold."

If an individual was training for a marathon, for example, this could interfere with training and have an impact on the final time, whereby seconds could mean the difference between winning and losing. Gray said a personalised nutrition strategy was one factor that could help to counter this.

**Why are athletes more vulnerable?**
Gray said the 'open window' theory of why athletes were more prone to this kind of illness explained that up to a few days after heavy exercise the immune system was suppressed, meaning it was less effective in searching out pathogens in the body giving the infection a greater chance to take hold. Discussing the various risk factors, he said: "People, particularly female athletes, often are not consuming enough of the right nutrients. So that can put people at risk."

**Eating your way to a solution**
In Gray's recently published research he looked at the impact of supplementation of 550 mg of omega-3 DHA, 550 mg EPA, 10 micrograms (µg) vitamin D3 and 8 g whey protein for a period of 16 weeks compared to a placebo on a total of 42 young recreational athletes. The product used in the experiment was a sports nutrition drink made by Norwegian firm Smartfish.

The results showed that the drink did not modify the incidence, severity or duration of URTIs, although the total number of symptom days established through a survey was reduced. Gray said the study design of multiple nutrients vs. placebo meant these results were difficult to pin down to one ingredient. Yet he said he had not been disappointed by the findings.

"You always have a hypothesis and if what you do doesn't show that it's just the way it is. If anything I find it more interesting if it doesn't go the way you'd think it would because that makes you think: 'Well I wonder why.'"

In general, Gray said athletes should be looking into personalised nutrition solutions to counter this higher risk of URTI. "I think it needs to be more individual, so if you tested somebody and you saw that they had low

evidence of omega-3 then that would probably be useful. If they were vitamin D deficient that would be useful. You need to personalise it I think."

His personal theory was that a diet of high carbohydrates in order to fuel the immune system, high protein and all the RDAs of vitamins and omega-3 was the way to go, as well as ensuring that the individual was not already deficient in things like vitamin D.

He said one limitation of his latest study was that participants were not tested to determine whether they were vitamin D deficient. There is one approved health claim for vitamin D in the EU, stating that it "contributes to the normal function of the immune system".

❁❁❁

**Sports Drinks Aren't Enough to Boost Performance – Salt May Help**

05-Mar-2015 Nutra Ingredients USA

**Salt supplementation may improve exercise performance according to Spanish researchers – but health claims for sodium are still not authorised.**

The scientists, led by Juan Del Coso of the University of Camilo Jose Cera, suggest that salt supplementation increases the amount of fluid drunk, compensates for electrolyte loss and promotes its retention through osmosis, thus improving performance. According to Cera the concentration of sodium, potassium and chloride in sports drinks are well below the levels lost in sweat, therefore reducing their efficacy.

**The study**

Researches carried out a randomised double-blind trial involving 26 experienced triathletes who were matched for age, body type and training status. During a real half-ironman triathlon, the salt group ate a total of 2580 mg of sodium, 3979 mg of chloride, 756 mg of potassium and 132 mg of magnesium while the control group was given cellulose.

Blood samples were taken before and after the triathlon to measure electrolyte levels in serum and subjects completed a questionnaire rating tiredness. The salt group completed the triathlon at a "significantly" lower time (307 minutes compared with 333 for the placebo), outperforming the placebo for speed across all three categories ( 8.26 metres/second compared with 7.74 in cycling, for instance).

However there was no difference in perceived exertion or muscle soreness between the groups. "These benefits were probably driven by a higher voluntary fluid intake during the race and higher serum electrolyte concentrations. Moreover, oral salt intake did not produce side effects when compared with a placebo. Thus, oral salt supplements might be an ergogenic aid for long-distance triathlon events," the study says.

**Sodium – a single message that ignores scientific advice**

Sodium alone was approved by the European Food Safety Authority (EFSA) in 2011 for its role in **muscle function** but the claim failed to make the permitted list because EU member state authorities deemed it to contradict public health advice to reduce sodium intake.

According to European Specialist Sports Nutrition Alliance (ESSNA) officer, Dr Mark Tallon, "This is an example of the EU regulating on an issue for policy reasons rather than science reasons. There are two different issues, one to do with repeated daily consumption of salt from food sources and then one-off consumption for sport."

He called for the EU to revise its sodium stance. "With adequate labelling on a product specifying the conditions for use – only to be taken during intense activity where there is a risk of dehydration – EFSA could provide good health policy for the general population that is not at the expense of those engaging in a special activity."

❁❁❁

**Fat Fighting Microbes? New Study Backs GM Probiotic to Suppress Obesity**

23-Mar-2015 Nutra Ingredients USA

**Intestinal bacteria that have been genetically modified to secrete appetite supressing metabolites could help battle obesity and type 2 diabetes, according to initial findings in mice.**

Researchers developed a modified version of the probiotic gut bacteria E. coli Nissle 1917 to generate a molecule that through normal metabolism, becomes a hunger-suppressing lipid – and found that mice that drank water laced with the engineered bacteria ate less, had lower body fat and staved off diabetes, even when fed a high-fat diet.

Led by Sean Davies and colleagues at Vanderbilt University team modified the bacteria to produce N-acyl-phosphatidylethanolamines (NAPEs), which are produced in the small intestine after a meal and are quickly converted into potent appetite-suppressing lipids known as N-acyl-ethanolamines (NAEs).

“We genetically modified the intestinal bacteria E. coli Nissle 1917 to secrete NAPEs by expressing NAPE acyltransferase (pNAPE-EcN),” explained the team. “We found that administration of pNAPE-EcN bacteria to mice in their drinking water markedly inhibited body weight and body fat gain of mice fed a high-fat diet compared to mice administered control bacteria or vehicle only.”

“Our studies provide proof-of-concept that incorporating bacteria engineered to secrete NAPE into the gut microbiota can be an effective long-term strategy for inhibiting development of obesity and provide insight into the mechanisms of action of these therapeutic bacteria,” added Davies and his colleagues, who will describe their approach in a presentation at the 249th National Meeting & Exposition of the American Chemical Society (ACS).

**Study details**
Davies and his team noted that research in recent years has demonstrated that the population of microbes living in the gut may be a key factor in determining the risk for obesity and related diseases - suggesting that strategically altering the gut microbiome may have beneficial impacts on human health.

In the current study, mice that are pre-disposed to obesity and fatty liver disease were fed the engineered bacteria in water and compared to those fed just water or a non-engineered control bacteria in water. Compared to mice that received plain water or water containing control bacteria, the mice drinking the NAPE-making bacteria gained 15% less weight over the eight weeks of treatment, said the team. In addition, their livers and glucose metabolism were better than in the control mice. Indeed, mice that received the engineered bacteria remained lighter and leaner than control mice for up to 12 weeks after testing ended, they noted.

**NAPEs or NAEs for human trials?**
In a further experiment, Davies and his team found that mice which lacked the enzyme to produce NAEs from NAPEs were not helped by the NAPE-making bacteria; but this could be overcome by giving the mice NAE-making bacteria instead. "This suggests that it might be best to use NAE-making bacteria in eventual clinical trials," said Davies, noting that it may be possible that some people don't make very much of the enzyme that converts NAPEs to NAEs. "We think that this would work very well in humans."

According to the team, the main obstacle to starting human trials is the potential risk that a person could transmit these special bacteria to another by faecal exposure. "We don't want individuals to be unintentionally treated without their knowledge," Davies added. "Especially because you could imagine that there might be some individuals, say the very young or old or those with specific diseases, who could be harmed by being exposed to an appetite-suppressing bacteria. We are working on genetically modifying the bacteria to significantly reduce its ability to be transmitted,” he confirmed.
❁❁❁

# FOOD SCIENCE & INDUSTRY NEWS

**Nutritional, Cereal Bar Sales to Hit $8 Billion by 2019**
March 09, 2015 Food Product Design

Increased snacking trends and consumers' busy lifestyles are transforming the traditional breakfast to a more on-the-go eating occasion, opening the door to increased opportunity for innovation in the snack bar sector. According to a new report from Packaged Facts, the overall market for snack bars, including both nutritional and cereal/granola bars, is projected to reach $8 billion in 2019.

The "Nutritional and Cereal Bars in the U.S., 4th Edition" report found between 2004 and 2014 the number of households using cereal bars increased 50 percent and the number consuming chewy granola (category that includes granola bars) increased 33 percent. The popularity of granola also grew substantially, with nearly 80 percent more households using it. At the same time, the number of households using cold cereal was up by only 4 percent. Meanwhile other traditional breakfast foods such as bacon, sausage and eggs barely kept up with the growth in the adult population.

Beyond breakfast, nutritional and cereal bars have gained a general widespread popularity. Between 2009 and 2014 the number of adults using nutritional bars increased 11 percent. In addition, around 44 percent of adults used cereal/granola bars in 2014. Bars are an easy way for consumers to stop eating three meals a day at set times and to start eating smaller portions of food throughout the day, whether they are on the go or at home.

Product designers also must consider new nutritional demands from the increasingly health-conscious consumer. Bars provide an attractive way for food marketers to offer alternative, exotic sources of protein; bold, exciting flavors; ingredients with a health halo resulting from their organic and "natural" characteristics; and superfoods and other functional ingredients targeting specific health concerns such as a desire or need for food to be gluten-free. Nutrition bars provide an especially appropriate platform to deliver the kind of dense nutrition today's consumers crave and search for in sources such as ancient grains and healthy seeds, including quinoa, amaranth, sorghum, chia and flaxseed.

❁❁❁

**New low-calorie way to cook rice could help cut rising obesity rates**

March 23, 2015 Science Daily
Summary: Scientists have developed a new, simple way to cook rice that could cut the number of calories absorbed by the body by more than half, potentially reducing obesity rates, which is especially important in countries where the food is a staple.

Scientists have developed a new, simple way to cook rice that could cut the number of calories absorbed by the body by more than half, potentially reducing obesity rates, which is especially important in countries where the food is a staple.

The number of people who are overweight or obese is steadily increasing. As lifestyles change and people become more sedentary, their diets also change. Serving sizes grow, and more food options become available. In addition to consuming more fats and sugars, people may choose to fill up on starchy carbohydrates like rice, which has about 240 calories per cup.

"Because obesity is a growing health problem, especially in many developing countries, we wanted to find food-based solutions," says team leader Sudhair A. James, who is at the College of Chemical Sciences, Colombo, Western, Sri Lanka. "We discovered that increasing rice resistant starch (RS) concentrations was a novel way to approach the problem." By using a specific heating and cooking regimen, he says, the scientists concluded that "if the best rice variety is processed, it might reduce the calories by about 50-60 percent."

He explains that starch can be digestible or indigestible. Starch is a component of rice, and it has both types. Unlike digestible types of starch, RS is not broken down in the small intestine, where carbohydrates normally are metabolized into glucose and other simple sugars and absorbed into the bloodstream. Thus, the researchers reasoned that if they could transform digestible starch into RS, then that could lower the number of usable calories of the rice.

And rice is loaded with starch (1.6 ounces in a cup), says James. "After your body converts carbohydrates into glucose, any leftover fuel gets converted into a polysaccharide carbohydrate called glycogen," he explains. "Your liver and muscles store glycogen for energy and quickly turn it back into glucose as needed. The issue is that the excess glucose that doesn't get converted to glycogen ends up turning into fat, which can lead to excessive weight or obesity."

The team experimented with 38 kinds of rice from Sri Lanka, developing a new way of cooking rice that increased the RS content. In this method, they added a teaspoon of coconut oil to boiling water. Then, they added a half a cup of rice. They simmered this for 40 minutes, but one could boil it for 20-25 minutes instead, the researchers note. Then, they refrigerated it for 12 hours. This procedure increased the RS by 10 times for traditional, non-fortified rice.

How can such a simple change in cooking result in a lower-calorie food? James explains that the oil enters the starch granules during cooking, changing its architecture so that it becomes resistant to the action of digestive enzymes. This means that fewer calories ultimately get absorbed into the body. "The cooling is essential because amylose, the soluble part of the starch, leaves the granules during gelatinization," explains James. "Cooling for 12 hours will lead to formation of hydrogen bonds between the amylose molecules outside the rice grains which also turns it into a resistant starch." Reheating the rice for consumption, he notes, does not affect the RS levels.

He says that the next step will be to complete studies with human subjects to learn which varieties of rice might be best suited to the calorie-reduction process. The team also will check out whether other oils besides coconut have this effect.

❁❁❁

**'Heat-beater' beans could protect staple food as planet warms**
25 March 2015 Medical News Today

A major breakthrough by bean breeders promises to secure the staple food of hundreds of millions of people around the world, as this vital source of protein comes under threat from rising global temperatures. For nearly half a billion people - most of them in Latin America and Africa - the humble bean, of which there are many varieties, is the main source of daily protein.

*Beans are a staple food for nearly half a billion people.*

Beans are highly nutritious - not only do they contain protein, but they also add fiber, complex carbohydrates, vitamins and other micronutrients to the diet. Amid fears that global warming could threaten this important food, bean breeders at CGIAR - a global group dedicated to increasing food security and human health - have created 30 new types of "heat-beater" beans. Researchers at CGIAR had previously warned that rising global temperatures could threaten bean production in the Latin American countries of Nicaragua, Haiti, Brazil, and Honduras, while in Africa, Malawi and the Democratic Republic of the Congo would be the most vulnerable, followed by Tanzania, Uganda and Kenya.

**Crosses with common beans and the heat-tolerant tepary bean**

Many of the new heat-beater beans are crosses between commonly consumed types - such as pinto, white, black and kidney beans - and the heat-tolerant tepary bean, which has been grown as a staple since pre-Columbian times in what is now northern Mexico and the American southwest.

Steve Beebe, a senior CGIAR bean researcher based in Colombia, says: "This discovery could be a big boon for bean production because we are facing a dire situation where, by 2050, global warming could reduce areas suitable for growing beans by 50%." He explains that the heat-tolerant beans they tested may withstand the worst-case scenario - where greenhouse gas build-up leads to an average increase of global temperature of 4 degrees Celsius (about 7.2 degrees Fahrenheit).

"Even if they can only handle a 3-degree rise, that would still limit the bean production area lost to climate change to about 5%," he notes. "And farmers could potentially make up for that by using these beans to expand their production of the crop in countries like Nicaragua and Malawi, where beans are essential to survival."

As well as developing the beans to have increased heat tolerance, the researchers are breeding them to contain more iron to enhance their nutritional value.

**Over 1,000 bean lines tested to find most heat-tolerant**

The researchers tested more than 1,000 bean lines to find the best varieties to breed for heat-tolerance. They were already looking for beans that were tolerant to drought and poor soils. They tested the beans at facilities on Colombia's Caribbean coast, where they deliberately exposed the legumes to nighttime temperatures well above those they would normally tolerate.

The beans are most vulnerable to rising temperatures at night, when pollination - which is very temperature sensitive - takes place. Among the beans they found to be especially tolerant to heat was one recently brought into commercial production in Nicaragua because of its high drought tolerance. In Costa Rica, tests with the new bean showed it produced double the normal crop yield. Beebe says they now have evidence that this increased yield was not just because of better drought tolerance but also due to heat tolerance: "What this shows us is that heat may already be hurting bean production in Central America far more than we thought and farmers could benefit from adopting the new heat-beater beans right now."

Beans do not only provide much-needed protein and nutrients, they also have other health benefits. For example, *Medical News Today* recently reported new research that showed a variety of black bean that is commonly consumed in Mexico may help lower blood pressure and also has antioxidant properties. The researchers, from the National School of Biological Sciences of the National Polytechnic Institute in Mexico, also found evidence that proteins in the Jamapa bean can remove heavy metals from the body.

❁❁❁

Biased by Industry? Do Academic and Business Collaborations Work?

02-Mar-2015 Nutra Ingredients USA

**Like many areas of nutrition research, probiotic and prebiotic science relies on strong collaboration between academic experts and businesses. But there are some who say such links create biased science.**

Recent reports that top scientific advisors may be influenced by links to 'big food' have generated a huge amount of debate over the role that academics and industrial researchers have in developing new science on the role of diet in health, and in particular in rigorously testing new products and developments for their potential health benefits.

Speaking to NutraIngredients at the recent Probiota 2015 event in Amsterdam, top academics and business leaders came together to explain why they believe it is vital that the links between academia and industry remain strong, but impartial. Jason Tetro, a microbiologist and 'germvangelist' said that parnerships with industry and academia are a good thing in principle, but warned that while it is 'wonderful' to have a parnertship, an academic must stay firm in getting to the cvorrect research findings.

Professor Bob Rastall, from the University of Reading noted that partnerships between a university and a company can help to translate basic research in to somehting that can be used and be beneficial for people. *"At the end of the day, I want my research to be useful, I want to have an impact, and that means getting it out there via the food industry,"* commented Rastall.

Meanwhile Dr Thomas Tompkins, R&D director at Lallemand suggested that a firm that does all of it's research internally could potentially be seen as being biased, adding that it is good that companies can work with leading experts and specialists in different fields - without always needing to have that expertise internally.

❁❁❁

**Coconut Sugar: The Latest Sugar Alternative**

24-Feb-2015 Food Navigator USA

**Coconut sugar is increasing in popularity because it is seen as being a healthier, more ethical alternative to sugar - but nutritionists remain sceptical of the health claims.**

While coconut sugar remains a fairly niche product, sales are on the rise. UK-based wholesale retailer, Naturya, says its sales have nearly doubled in the past year. *"Coconut sugar has always sold well, but this year sales have risen dramatically. We believe that the demand for coconut sugar is on the rise and will eventually become mainstream,"* said Nettie Wells, account manager at Naturya.

According to David Turner, food and drink analyst for Mintel, this is part of a growing trend: “People are turning to alternative sugars – coconut sugar, apple sugar or agave– because they seem healthier even if they are still 100% sugar.”

**A healthy image – that’s all but that’s enough**
Producers of coconut sugar – which is made from the sap of cut flowers - claim that it is a healthier alternative to cane sugar, containing key vitamins, minerals and phytonutrients such as potassium, zinc, iron and vitamins B1, B2, B3 and B6, while the Food and Nutrition Research Institute of the Philippines conducted a study into coconut sugar and concluded that it has a low glycemic index of 35.

However, the study featured just 10 volunteers and also compared coconut sugar with glucose rather than sucrose. Nutritionist Carrie Ruxton also says these health claims need to be put into context. “Data from the Philippine Food and Nutrition Research Institute, which probably needs validating, show that coconut sugar qualifies as a ‘source’ of copper, phosphorus and vitamin C, and a ‘rich source’ of potassium and thiamin (vitamin B1). However, this is based on nutrients per 100g as the EU legislation demands and it is doubtful people would wish to eat this amount - providing nearly 400 calories a day – in order to get their vitamins and minerals!“

And yet even if the Philippine Research Institute’s health claims are considered dubious by their European suppliers - German distributor Kulau says on its website that it is up to individual buyers whether or not to trust the results – consumers are still buying.

**An artisan product for lifestyle consumers**
In addition to the supposed health benefits, many coconut sugar suppliers focus on the fact that their product is high-end, artisanal, organic and fairtrade, which holds great appeal with the ‘lohas’ (lifestyle of health and sustainability) target consumer. German company Lotao’s range of Java Kiss coconut sugar is marketed as a luxury product with a natural butter-caramel taste, while Kulau claims its coconut sugar is a “gourmet” product, ideal for use in cocktails and desserts.

Josefine Staats, founder of Kulau, told FoodNavigator: “It’s a bit expensive but then people are willing to spend more money on honey because it’s a natural product made by bees. Coconut sugar is complicated and labour intensive to produce as people have to climb the trees and cut the blossoms."People who buy coconut sugar are the kind of people who shop in fairtrade, organic stores – that’s 10% of the German population.”

Coconut sugar is also marketed as being more environmentally friendly than traditional cane sugar. Madhava claims that coconut palms produces 50-75% more sugar per acre than cane sugar, while using 20% of the resources. For Turner, the growing popularity of coconut sugar is a marketing success story. “Coconut sugar and palm sugar are basically the same thing but with a different marketing strategy. People think ‘How can palm sugar be good if palm oil isn’t?’ and so this is a way for the industry to call palm sugar by another name,” the analyst said.

Palm sugar is made from the sap of date or arenga palms using the same production methods. For Carrie Ruxton, however, there are public health implications involved in selling the idea that some sugars are healthier than others.
"I think it is misleading because sucrose from cane or beet sugar is just as natural as sugars derived from the processing of coconut, agave and other plant products.

"All mono- and disaccharides can increase our risk of dental decay and all sugars and starches, apart from fructose, increase blood sugar levels, so there is really no such thing as a healthy sugar. Instead, we should focus on managing the glycaemic load of our overall diets, by choosing higher fibre foods, and aim to eat a moderate amount of sugar within a healthy, balanced diet, ” she said.
❁❁❁

**Better Together? Co-encapsulation Study Shows Potential for Stable Omega-3 and Probiotic Mix**

05-Mar-2015 Nutra Ingredients USA

**New research describing the stable co-encapsulation of omega-3 rich oil with probiotic bacteria could be a boon for manufacturers looking to incorporate the functional ingredients in to foods and supplements, say researchers.**

The research, published in the *Journal of Functional Foods*, explored ways to produce a co-encapsulated omega-3 and probiotic using a whey protein isolate (WPI) and gum Arabic complex (GA) – finding that omega-3 fatty acids and probiotic bacteria can form a stable co-encapsulate using a single WPI-GA coacervate microcapsule that can then be either spray dried or freeze dried to form a powder.

Led by Divya Eratte from Federation University Australia, the team noted that interest in the consumption of foods that contain probiotic bacteria is increasing steadily, while there is also a high commercial demand for omega-3 fatty acids. "When probiotic bacteria and omega-3 fatty acids are co-encapsulated in a single product, there may be synergistic health benefits," wrote Eratte and colleagues. "A synergetic effect between omega-3 fatty acids and probiotic bacteria during digestion has been reported, where omega-3 lipids help probiotic bacteria attach to the intestinal wall. There may also be stability benefits of co-microencapsulation."

"This study represents the first systematic attempt to develop a single microcapsule capable of delivering omega-3 fatty acids and probiotic bacteria together in one particle," they said. Such co-encapsulated microcapsules - containing omega-3 fatty acids and probiotic bacteria - will be useful for the stabilised delivery of these two important functional ingredients together into functional food and nutraceutical applications, said Eratte and her team.

**Co-encapsulation study**

While the idea of co-encapsulation has been widely used in pharmaceutical delivery systems, the team noted that the co-encapsulation of more than one bioactive component with different characteristics - such as omega-3 oil (hydrophobic) and probiotic bacteria (hydrophilic) - is challenging and has not been reported.

The Australian researchers compared the microencapsulation of the probiotic (P) bacteria *L. casei* 431 in a WPI–GA complex coacervate matrix forming WPI-P-GA microcapsules, in addition to the co-encapsulation of *L. casei* 431 and omega-3 rich tuna oil (O) in WPI–GA matrix, forming WPI-P-O-GA microcapsules through complex coacervation.

"The novelty or significance of this study lies in the fact that it investigates whether probiotic bacteria and omega-3 fatty acids can be co-encapsulated in WPI–GA complex coacervate and if such co-encapsulation contributes synergistically to the survival of bacteria and the oxidative stability of the omega-3 fatty acids," said the authors. According to the team, both the encapsulation of L. casei 431 alone in to a WPI-GA matrix and the co-encapsulation of L. casei and omega-3 rich tuna oil in WPI-GA, was successful.

After this, the liquid capsules containing bacterial cells and also bacterial cells together with tuna oil were converted into powder form using either spray drying or freeze drying. The team found that the viability of the *L. casei* was significantly ($p > 0.05$) higher when co-encapsulated with tuna oil in WPI–GA complex coacervates rather than being encapsulated on its own in the same shell matrix. Meanwhile, the oxidative stability of tuna oil was significantly higher in spray dried co-capsules than in freeze dried ones, they said. All the microcapsules produced were amorphous in nature, said the team.

❁❁❁

# FOOD SAFETY & REGULATORY NEWS

## Traffic light food labels strengthen self-control

March 9, 2015 Science Daily
Summary: Should food products be labeled with traffic light symbols to make health-related information on ingredients easier to understand? This question has remained a subject of debate. Now researchers have reached the conclusion that the traffic light label is more effective in helping consumers resist high-calorie foods than a purely information-based label. Scientists observed study participants in the brain scanner as they made purchase decisions.

Should food products be labeled with traffic light symbols to make health-related information on ingredients easier to understand? This question has remained a subject of debate. Now researchers at the University of Bonn have reached the conclusion that the traffic light label is more effective in helping consumers resist high-calorie foods than a purely information-based label. Scientists observed study participants in the brain scanner as they made purchase decisions. The study has just been published in the journal Obesity.

Red, yellow, green: The traffic signal labels on packages are supposed to be an easy-to-understand indication of the overall "healthiness" of a food product. For example, "red" symbolizes a high percentage of fat, sugar or salt, "green" a lower percentage. Just as on an actual traffic light, yellow falls in the middle. " This is the first study that analyzes the effect that traffic light signals have on the evaluation processes in the consumer's brain when making a purchase decision," says Prof. Dr. Bernd Weber of the Center for Economics and Neuroscience (CENs) at the University of Bonn. Do the "traffic lights" help consumers choose a healthier diet when grocery shopping? Scientists from the CENs have addressed this question in a recent study.

### 100 products -- from chocolate to ready-to-serve meals

A total of 35 adult study participants, 19 of which were women, participated in the study at the Life & Brain Center in Bonn. 100 products and their nutritional information were shown to the participants lying in the brain scanner -- from chocolate to yogurt to ready-to-serve meals. The participants were shown this information either in the form of currently used nutrition labels with grams and percentages per portion, or in the form of traffic light labels. Then participants had to indicate how much they were willing to pay for a particular product.

The participants were willing to pay significantly more money for the same product when the traffic light label was "green" compared to an information-based label. However, if the label was "red," the willingness to pay decreased more compared to the conventional information. "You can conclude that the traffic light label acts as a reinforcer: The health relevance of the ingredients is weighed more heavily into purchasing decisions compared to simple nutrition information," says first author Laura Enax of CENs.

### Two brain regions affect the reward system

While study participants were thinking about what price they wanted to pay for a particular product, the scientists recorded the activity of various brain regions using functional magnetic resonance imaging. A red traffic light label activated a structure in the left inferior frontal gyrus, which has been repeatedly shown to be important for self-control. Activity in this region influenced the ventromedial prefrontal cortex, a region that "calculates" the subjective value of a product via the reward system, leading to decreased willingness to pay for unhealthy products.

"The traffic light label appears to enable the study participants to better resist unhealthy foods compared to a label containing the traditional information on grams and percentages of the particular ingredients. A traffic light label probably implicitly increases the weight consumers place on healthiness in their decision," says

Prof. Weber, summarizing the result. The scientists at the University of Bonn now want to examine more closely how different types of food labels can be used to support consumers in their decision-making.

❁❁❁

**Fast-food ban in L.A. fails to improve diets or cut obesity, study finds**

March 19, 2015 Science Daily
Summary: In 2008, the city of Los Angeles passed a law restricting the opening or expansion of any 'stand-alone fast-food restaurant' in low-income neighborhoods where obesity was a problem. A new study finds the measure has failed to reduce fast-food consumption or reduce obesity rates in the targeted neighborhoods. A Los Angeles ordinance designed to curb obesity in low-income areas by restricting the opening of new fast-food restaurants has failed to reduce fast-food consumption or reduce obesity rates in the targeted neighborhoods, according to a new RAND Corporation study.

Since the fast-food restrictions were passed in 2008, overweight and obesity rates in South Los Angeles and other neighborhoods targeted by the law have increased faster than in other parts of the city or other parts of the county, according to findings published online by the journal *Social Science & Medicine*.

"The South Los Angeles fast food ban may have symbolic value, but it has had no measurable impact in improving diets or reducing obesity," said Roland Sturm, lead author of the study and a senior economist at RAND, a nonprofit research organization. "This should not come as a surprise: Most food outlets in the area are small food stores or small restaurants with limited seating that are not affected by the policy."

The policy is a zoning regulation that restricts the opening or expansion of any "stand-alone fast-food restaurant" in Baldwin Hills, Leimert Park, and portions of South Los Angeles and Southeast Los Angeles. The areas subject to the rule have about 700,000 residents. While the rule was not the nation's first local regulation limiting fast-food outlets, it was the first one presented as a public health measure by advocates.

Sturm and co-author Aiko Hattori of the University of North Carolina, Chapel Hill, examined the fast-food ban by analyzing information from two sources. They tracked the opening of new food outlets across the city by reviewing permits issued by the Los Angeles County Department of Public Health, which licenses and inspects all food outlets.

Information about neighborhood eating habits and weight came from three different waves of the California Health Interview Survey, which polls residents across the state about an array of health issues. Participants from South Los Angeles and other neighborhoods targeted by the ordinance were compared to residents from other parts of Los Angeles.

Examining weight trends across the city, researchers found that both obesity and being overweight increased in all areas from 2007 to 2012, with the increase being significantly greater in areas covered by the fast-food ordinance. In addition, fast-food consumption increased in all areas since the ban was passed, but was statistically similar across all areas.

Before the ban was passed as well as three years later, the average body mass index (a ratio of weight to height) and the proportion of people who were obese or overweight were higher in South Los Angeles than in other areas of the city. That gap continued to widen from 2008 to 2012.

"The one bright spot we found is that soft drink consumption dropped, but the decrease was similar in all areas across Los Angeles," Hattori said. "Unfortunately, the rates of overweight and obesity increased and they increased fastest in the area subject to the fast-food ban."

Researchers found that about 10 percent of food outlets in Los Angeles are new since the regulation was approved, but there was no evidence that the composition of those establishments has changed as a result of the ordinance. New food outlets in South Los Angeles were most likely to be small food stores while new food outlets in other parts of the city were most likely to be larger independent restaurants.

There were 17 new permits for outlets belonging to larger fast-food chains in South Los Angeles from 2008 to 2012, just slightly more than in other parts of the city, but none of them were stand-alone restaurants. The findings show the ordinance has done little to reshape the retail food landscape in the targeted neighborhoods.

❁❁❁

**New screening, detection and extraction methods for priority contaminants in seafood**
4 March 2015 Medical News Today

The EU-funded ECsafeSEAFOOD project is improving seafood safety in Europe by assessing food safety issues related to contaminants present in seafood as a result of environmental contamination, and evaluating their impact on public health.

The project's multidisciplinary team has developed new, sensitive and rapid screening, detection and extraction methods for priority contaminants. ECsafeSEAFOOD specifically focuses on priority contaminants that have not yet been regulated in the EU, including those originating from harmful algal blooms and those associated with marine litter. These contaminants include microplastics, pharmaceuticals, endocrine (gland) disrupting compounds, personal care products (e.g. musks), marine biotoxins, and heavy metals (e.g. methylmercury).

Currently, ECsafeSEAFOOD partners are finalising optimisation tools for assessing the toxicological impact of the contaminants. These tools will provide a better indication of the adverse effects of contaminants on human health. ECsafeSEAFOOD researchers have also examined the benefits and risks associated with processing and cooking seafood, based on the potential for unregulated contaminants to be absorbed by marine organisms as well as the effects of global warming on bioaccumulation and elimination of contaminants.

An online consumer tool which provides details of the benefits and risks of consuming different species of seafood is currently in development. This will enable consumers, health professionals and seafood producers to utilise some of the results of ECsafeSEAFOOD directly.

Dr Antonio Marques, ECsafeSEAFOOD project coordinator, said: "We are now halfway through the project and have already had great success. The progress has been enormous and interesting outputs are beginning to emerge. All the project partners are enthusiastic and eager to begin sharing the project's unique results."

The advances made by the project so far were presented at the fifth ECsafeSEAFOOD coordination meeting, hosted by AZTI-Tecnalia in Bilbao, Spain, from 11-12 February 2015. The project's major results to date will also be detailed in an upcoming ECsafeSEAFOOD special issue of *Environmental Research* journal entitled: "Non-regulated environmental contaminants in seafood: contributions of the ECsafeSEAFOOD project".

❁❁❁