

# PFNDAI Bulletin May 2009

## Editorial

APEDA initiated GrapeNet a couple of years ago as India's first effort at traceability. This is an internet based software system for monitoring pesticide residue, achieve standardisation and tracing from retail to farm of growers using sampling, testing, certification and packing. This was a great success with every consignment of fresh grapes from India to European Union (EU) being monitored through this system not only making India a dependable and quality supplier to EU but also benefiting large number of farmers and exporters of Maharashtra, Andhra Pradesh and Karnataka with better price.

The system involves farmers, state horticulture departments, testing labs, Agmark, phytosanitary department, pack houses, exporters and APEDA. Traceability through GrapeNet has helped over 40,000 grape farmers who have earned 40% more value with over Rs. 250 crores earned in 2007. Government is now planning to use similar system for mango, pomegranate, groundnut and organic foods. Fresh mango export is fetching Rs. 140 crores that can take a quantum jump if traceability is adopted. Thus India is slowly joining the traceability efforts to make the food safe globally. However, it must be realised that it takes time and immense efforts to put such system in place in a country like India.

Traceability records all movement of product or produce through supply chain with respect to quality and safety including the levels of pesticide residue. In case of food recall because of safety reasons, traceability system helps to identify which goods need to be recalled and which are safe. This not only saves efforts and money but also quickly pinpoints product that needs to be recalled ensuring greater safety to consumers. EU has made traceability compulsory for food in 2004.

India has a large number of farmers with small holdings of land that is farmed to produce crops that have a large number of varieties that have been traditionally grown. The supply chain is also so complicated that not only there are several middlemen before the produce comes to processing unit but also distribution of processed goods gets bifurcated in such small streams especially when products are marketed in rural areas.

It is comparatively easy when fresh produce is exported as fresh produce. However, when one considers formulated food product containing a number of ingredients some of which may be compound ingredients like spice mixes or condiments being produced by one manufacturer and used in many different products by others, traceability becomes a much more complicated process.

EU wants traceability of imported seafood from January 2010. Traceability in seafood calls for identification of fishing region, time of catch and the fishing boat and harbour where fish was landed among other things. The EU is the largest market for Indian seafood accounting for 25% of volume and 33% of value of total exports. Drop in exports

to EU would be catastrophic to Indian export. Shrimps are exported to the US and are easier to adapt to traceability as they are mostly from aquaculture farms. Exports to EU are composed of fish like cuttle, squid and ribbonfish wherein traceability is laborious and very expensive and implementing it in developing country like India, where modern and traditional systems of fishing coexist, would be almost impossible in such a short time. Some exporters are worried that it might develop as a non-tariff barrier on Indian seafood.

India may get more time to implement traceability but there are advantages of implementing traceability as it would not only lead to safer food supply but also greater gains for exporting country as it develops greater sense of security among consumers. Seafood exporters and MPEDA are trying to get the system in place.

Both government and industry will have to concentrate efforts on traceability being developed for Indian food products. Although it is not easy and it will be very time consuming. It will also need a lot of government support especially for agriculture sector in order to make this system possible just as in grapes. Industry, both small and large, along with all the ancillary units will have to join in this difficult venture as once in place it will give huge benefits to all stakeholders.

Two new members have joined the Association. We welcome Monsanto and DPO Food Specialities who have been admitted as members by Governing Board. We hope they have a long and very useful association with us. With season's greetings

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## **Flavour: The Delightful Sensation of Foods**

**Dr. Jagadish S. Pai**

**Flavour** is a sensation felt when food is consumed. It not only is a combined attribute of mostly the aroma (or smell or odour) and the taste of the food but some other important sensory perceptions including tactile (chalky, soft, thick, sticky), pain (sharp, biting, pungent), auditory (crisp, crackly) along with temperature (hot, cold) sensations also make an impact on flavour sensation of a food product. There is also an influence of colour and appearance on the acceptability of flavour as per the scientists.

When the food is just smelled, only part of the flavour sensation makes impact namely aroma or odour. When tea or coffee is brewed we get the aroma of it but only when we drink it do we get the complete flavour of it including the taste which is sweet and to a very small extent bitter or more precisely astringent. In addition, temperature is very important. If tea or coffee is not hot, it does not appeal us, although some prefer it chilled in the form of cold coffee or tea. Ice cream if not very cold, is not very desirable.

Chocolates create cooling sensation in the mouth because of melting of cocoa butter, while a cheaper substitute prepared with hardened fat may not do so giving a poorer flavour sensation. Chilli peppers with its pungency create pain sensation which is highly preferred by Indians and Mexicans. Candy, toffee, caramels, and some other sweets and confectionery products have thick, sticky sensation which not only makes them stay longer in mouth but also gives a pleasure sensation to kids. Crackers if not crisp and crackly are not desirable just as some savoury products like sev, papdi etc. Colour and appearance also play an indirect role in flavour preference so strawberry flavoured beverage is coloured red and not green or blue while chocolate looking shiny is highly preferred to a product that is without shine due to fat bloom. Thus besides aroma and taste, many other sensory properties contribute to the total flavour of foods.

## **Taste**

There are four basic tastes including sweet, sour, salty and bitter. Most like sweet taste of confectionery and sweet meats products including candy, chocolate, pedha, burfi, jalebi, gulab jamun etc. The most common sweetener is sucrose obtained from sugar cane or sugar beet. Other sweeteners are glucose, fructose, sorbitol, corn syrup, high fructose corn syrup, invert sugars etc. among the natural sweeteners. There are artificial and intense sweeteners such as saccharin, aspartame, acesulphame K and sucralose that may be included in foods that have to be restricted in calories e.g. in foods for weight watchers or for diabetics.

Sour taste is due to acids present in foods including citric, malic, acetic, lactic and tartaric acids. Citric is the most common acid and is present in most fruits especially in citrus fruits. Malic is present in apples. Vinegar has acetic acid, while fermented milk products like curd, shrikhand and buttermilk have lactic acid while grapes and wine have tartaric acid. Different acids have different sourness impact. Thus citrus products usually contain compatible citric acid.

Saltiness is due to mainly common salt i.e. sodium chloride. There are other mineral salts that also give salty taste but preferred taste is of common salt. Different sources like sea and rock salt have different compositions of other substances giving different tastes. Even the extent of refinement has an effect of taste of the salt.

There are bitter substances like caffeine, quinine etc. that give classic bitter taste. Some of the common foods giving bitter taste are coffee, dark chocolate, beer etc. Many medicines taste bitter. Strong tea is said to be bitter although it may be because of astringency of tannins that is different from bitterness. Typical astringent substance is alum.

Tongue has different regions where different taste cells are concentrated and when food containing taste substances make contact with them taste sensation is experienced.

## **Aroma**

While taste is sensed by tongue, aroma is experienced by nose. Just before drinking coffee or tea, we get its aroma as volatile substances from it enter the nose while we sniff

and make contact with odour cells before going towards the throat. Aroma substances are also sensed while we eat as these substances volatilise while we chew and they enter the nasal cavity from the back of our mouth. Thus we get the sensation of both taste and aroma while eating.

Chemical	Odor
Diacetyl	Buttery
Isoamyl acetate	Banana
Cinnamic aldehyde	Cinnamon
Ethyl propionate	Fruity
Limonene	Orange
Allyl hexanoate	Pineapple
Methyl salicylate	Wintergreen
Benzaldehyde	Bitter almond

Although taste is easier to classify into different types, aroma or odour classification has been more elusive and there still exists disagreement between scientists although some attempts have been made to identify sweet, floral, fruity, woody, green, oriental or spicy etc. notes in the aroma of the foods and fragrances.

Natural aroma was found to contain a large number of chemical substances and artificial aroma could be produced by mixing in proper proportion many of these substances. Some chemicals have very strong odour of some foods and are used in formulations of flavours.

Synthetic flavours could be prepared by mixing chemicals in proportion so as to resemble the natural aroma of the food. Earlier flavours for use in foods were natural materials including extracts and essences of various foods and natural materials, spices and other aromatic materials. Later isolates were also used that were more powerful than the whole materials. Synthetic and artificial chemicals have given a big boost to the flavour and fragrance industry making preparations not only very similar to the natural but also very cost effective. The global flavour and fragrance industry is around US\$ 20 billion with roughly half being contributed by flavour.

Flavours are used in food products not only to give flavour to formulated products like carbonated soft drinks, biscuits and cookies, but also to enhance the flavour of some of the products that may have been lost during processing but also to maintain uniformity in flavour of different batches. Chocolate flavour may be added to milk based beverages that may not have any chocolate or lemon flavour may be added to hard boiled candy to give lemony taste. Some fruit drinks containing 5 to 10% fruit content may lack in flavour unless externally added. Bakery products may lose flavour and may at times need addition so at any time it would have uniform flavour of certain ingredients that they contain. Flavour as it is recognised in industry and by consumers is mostly due to the aroma contribution of the flavouring materials and most of the discussion covers aroma chemicals.

When flavour is added to food products, there must be a declaration to that effect as per Indian laws. There are three types of flavours commonly added to food products. Natural flavours or flavouring substances that are obtained from plant materials commonly used for human consumption. Nature identical flavouring substances are either isolated from aromatic raw material or synthetically prepared and these are chemically identical to

substances present naturally in edible materials. Artificial flavouring substances are those that are not found existing naturally and are synthetically prepared. The label must declare the name and/or class name of the flavouring material used in the product.

Of the chemical senses smell is the main determinant of a food flavour. Tastes are limited to a few basic tastes, the smells of a food are potentially limitless. A food flavour can be easily altered by changing its smell while keeping taste similar as can be seen in artificially flavoured jellies, soft drinks and candies where the bases are made with similar taste. With the use of different odour substances dramatically different flavours are formulated.

## **Flavourants**

In the ancient history, flavours were created naturally in foods. When meats were roasted, vegetables were cooked and cereal doughs were baked the flavours were formed within the foods. When more variations were desired natural materials derived from a spice, fruit, vegetable, herbs and spices etc. were added for different flavours. Many extracts and isolated substances were prepared from natural flavourants including essential oil, oleoresin, essences, extractives etc. were prepared that were more powerful and consistent. Natural flavourants are expensive and of limited availability, so natural identical and artificial flavour substances are being increasingly used in industry.

There are some advantages to use of natural flavourants. These have been used for long and have been proven safe. Some of them are stable due to their in-built structure e.g. whole spices that could be kept under ambient conditions. However, their extracts and isolated essential oils are less stable. In natural flavourants many compounds are present that are complementary giving smoothness to the overall flavour. Natural flavours are also quite acceptable to consumers and they are difficult to copy due to the variation in the natural materials.

There are some advantages in synthetic and artificial flavours as they are available in more concentrated and pure form so only small amounts are needed. Their performance is consistent so exact flavour can be created. They can simulate natural flavours as well as create new ones. Sometimes there are undesirable or unpleasant notes in naturals which are removed in synthetics. The biggest advantages however are the cost and availability.

Synthetic flavours were prepared after studying the natural flavours with respect to their components. Natural foods say fruits like banana and mango have a couple of hundred compounds in their volatiles of which only some are typical of the flavour of that fruit, some others have supporting role to make it more balanced and well-rounded and many do not have much role to play. After the study of these by gas chromatography and mass spectrophotometry as well as sensory evaluation, a combination is made of such compounds normally synthetic chemicals but sometimes isolated from nature, which has some other chemicals such as solvent and fixative etc. to make a commercial preparation suitable for use in food products.

There are certain flavouring agents not permitted under PFA namely, coumarin & dihydro-coumarin, tonkabean, estragole, ethyl methyl ketone, ethyl 3-phenylglycidate, eugenyl methyl ether, methyl  $\beta$  naphthyl ketone, p-propylanisole, saffrole & isosaffrole, thojone and isothujone. Also certain solvent are not permitted in flavours e.g. diethyl glycol and mono-ethyl ether.

### Strawberry Flavour

Et Met Phe Glycidate	35.0%
Amyl aldehyde	0.5%
Bornyl acetate	0.5%
Ethyl caproate	2.0%
Vanillin	3.0%
Beta ionone	9.0%
Et Met p-Tolyl glycidate	12.0%
Iso-butyl acetate	30.0%
Ethyl butyrate	8.0%

### Newer Developments in Flavours

Some of the new generation flavours are being prepared studying the complex reactions involved in the formation of flavour while food is being prepared e.g. roasting of meat. Here proteins undergo changes at high temperature resulting in flavour. This is mimicked in flavour preparation which then could be added to foods that do not have meat or may lack in that flavour. Potato wafers can be flavoured by barbeque flavour using this technique.

Earlier methods of recovery of flavours from natural sources like fruits, spices, herbs etc. was by preparing essential oils by distillation, or by use of solvents to extract the flavour compounds. More recent methods include use of supercritical fluid like carbon dioxide for extracting flavour materials from spices and herbs. When supercritical conditions are used, carbon dioxide behaves like a solvent and can be used to extract flavours and then when brought back to ambient conditions the gas simply evaporates without leaving any traces of solvent. There are also modern processes of aroma recovery while fruit juices are being concentrated. Volatiles would contain aroma compounds which would then be concentrated to remove the unwanted bulk substances to produce high quality concentrated aroma that could be added back to concentrated juice or used as flavour for some other product.

**Flavour Enhancers:** There are some substances that enhance taste of meat, cheese, broth, mushroom etc. Soy sauce is used in Chinese foods to enhance their taste. Monosodium glutamate (MSG) in it is the flavour enhancer which in small quantities improves the flavour. It affects the taste receptor cells in tongue and is also considered to have the fifth taste sense called umami which in Japanese means tasty, meaty or savoury. There are also some ribonucleotides guanosine monophosphate (GMP) and inosine monophosphate (IMP) that enhance the flavours.

There are some individuals who are sensitive to MSG and show signs after consuming Chinese foods or foods containing MSG. Hence some countries including India makes it mandatory to label foods containing MSG to declare it.

## **Evaluation of flavour**

Flavours are evaluated in order to prepare new food products, to compare the flavours of competitors' products, to study effects of ingredients and processes on flavours and also for improvement in the quality of foods. Early methods of evaluation were organoleptic methods which just obtained opinions of a group of individuals on flavour of the food to be evaluated. This was more subjective than objective. Sensory evaluation was developed to study the flavour objectively considering the effects of various factors on flavour senses. This methodology has been developed into scientific evaluation and can be used to consistently evaluate products by trained panellists using standard methods.

Chemical and instrumental methods are also used to evaluate flavour components to identify their nature and quantities. Some of the instruments like mass spectrophotometer and gas chromatograph are highly sensitive and can detect the small amounts of some very powerful flavourants in food products. Usually a combination of sensory and chemical and/or instrumental methods are employed for evaluation of flavours in food industry.

## **Flavour Encapsulation**

Flavour is very unstable as the components are volatile. They are also affected by heat and light. Many of them are quite reactive with some food components and may get modified. All these damage the flavours and/or reduce their stability. Flavours can be stabilised by encapsulation to give a protective covering to their components. Encapsulation may be carried out by different methods.

Spray drying is the commonest form of encapsulation in which modified starch or gum arabic are used as coating materials with carriers such as maltodextrins, milk proteins, modified cellulose, hydrolysed gelatine, other gums etc. Spray dried encapsulated flavours are used in many seasonings and food products including cake, cookie, pudding and some instant mixes.

Some of the other methods of encapsulation are: Melt Extrusion or melt injection with carbohydrate carriers; Complex Coacervation using gum arabic and gelatine coacervate pair with glutaraldehyde as cross-linking agent; Lipid Encapsulation using fats that are solid at room temperature and  $\beta$ -cyclodextrin Complexation.

## **Future**

As flavour is one of the most important attribute of food products, along with the food industry flavour industry will grow only more rapidly. Consumers are demanding more flavourful foods as well as exotic flavours. Newer technology such as nanoparticle

technology using unique properties of submicron particles will be put to maximum use in the newer flavour delivery systems. Flavour enhancement will also be used to modify receptors with better understanding of neural signal transmission science. The global flavour industry for food application is over \$ 10 billion and growing rapidly. As growing markets like India and China are consuming more of processed foods, the demand will be growing steadily even without the growth in demand from established western markets. Newer technological developments and newer sources and ingredients will make the proceedings in industry highly exciting.



## THE EVOLUTION OF ANTIOXIDANTS

*In today's crowded market, product differentiation will be the centerpiece of a successful campaign to win over better-educated, cost-conscious consumers.*

With the current condition of the economy and the fixation of health care systems on treatment of diseases, prevention has become the key word in the struggle for optimal health. Antioxidants; as said by experts, will continue to appeal to larger demographics, with the growing awareness of our body's biological processes. Now, consumers are accepting the fact that antioxidants and products with immune enhancing benefits are good for health. They prefer dealing with their health before it becomes a problem. Younger people and in general those trying to maintain a healthy lifestyle are also beginning to buy into the antioxidant market.

The awareness about antioxidants has been growing rapidly in the last few years. The level of understating has also increased. Many consumers are aware about the origin of antioxidants and their association to health conditions. This has led to a rise in sales of various supplements, foods and particularly beverages. In 2007, the sales of antioxidants continued to grow by an overall 6%, reaching more than \$3 billion, according to estimates. The growth of non-vitamin antioxidant category has been most significant with an 11% sales increase. In this segment, antioxidants from fruits and vegetables witnessed an impressive 21% rise.

The top five selling antioxidants in 2007 remained the same as the previous year, only CoQ10 moved to the second spot by surpassing vitamin E. in terms of U.S sales and growth (2007), the top five were: 1. Vitamin C, \$884 million (2% growth), 2. CoQ10, \$413 million (8% growth), 3. Vitamin E, \$391 million (4% growth), 4. Vitamin A/ beta-carotene, \$315 million (9% growth) & 5. Noni juice, \$277 million (8% growth). Others include Plant oils (\$253 million), mangosteen juice (\$191 million), green tea extract (\$139 million), goji juice (\$98 million) and cranberry (\$76 million) rounded out the top 10.

Traditional antioxidant products like vitamin E, C and selenium have negative or very little growth, this is mainly due to bad reports given by the media about them. There have

been studies on vitamins that don't back antioxidant protection also an analysis in 2005 showed that high doses of vitamin E can be quite harmful. As a result its sale has declined. As these traditional antioxidants continue to lose their sheen, other newcomers are grabbing the limelight. There has been less of new science on these traditional antioxidant supplements and consumers are looking for what's new in the market. While the sale for selenium and soy isoflavones have gone down to 3% and 11% respectively, goji juice has become one of the top ten selling antioxidants with a sales growth of 51%. Even the sales of acai have grown by 83%.

## **Super (trend) fruits**

Goji berry and acai demonstrate the most sweeping trends that have greatly impacted the antioxidant market. This is due to the new love that has developed for super fruits. With the highly successful marketing campaign of Pom international, which brought in \$165 million sales in 2007, pomegranate products have grown in importance and have opened the door for antioxidant-packed fruits. This obsession with super fruits developed even before pomegranate came in. Banana was once considered a rare tropical fruit but not anymore. This is because familiarity resulted in increase in demand and the cache of having more impact than only flavour is a major benefit. Consumers now want good flavour along with nutrition.

Pomegranate has had a great impact. Its million dollar medical research and aggressive advertising promoted its products as having clinically proven antioxidant, heart and prostate benefits. Many major brands are using the terms antioxidant and superfruits in their marketing, to boost their sales. For example, a recent campaign tried to explain the benefits of polyphenols to mainstream consumers. This strategy paid off bringing a 4% rise in sales. Even Coca-Cola's Minute Maid brand has proved to be successful in pushing pomegranate juice blends by highlighting its antioxidant content. They're using this as a category to grow further. If a product tastes good, offers benefits and is available at a price close to related products, then the consumer will try it.

When the brands are well established, their messages seem to resonate well with the public. Consumers require proof that these antioxidants really work. When they view ads made by large and well-known companies, they feel more secure about their purchases. For example, Plano, TX-based Dr.Pepper Snapple group has been very active in the antioxidant market. Its latest product, Cherry 7UP Antioxidant contains 10% of the daily recommended value for vitamin E (per serving). The company has also been recognized for its Canada Dry Green Tea Ginger Ale, which claims to contain 200mg of antioxidants from green tea and vitamin C per 8-oz.

## **The Next Generation**

Super fruits include any fruit that contains a high or unique concentration of a specific nutrient or phytochemical. Lot of research is being done on new and existing fruits to discover compounds that could be beneficial. Many food and beverage companies in the U.S have started using these ingredients and are conducting their own GRAS (Generally

Recognized as Safe) self-determinations on new fruits that they want to bring into the market as a retail product. Along with the mainstream and emerging super fruits, the more established pomegranate, blueberry, cranberry, raspberry, acai, goji, noni, mangosteen and grape seed extract and many others are making a name for themselves. Acerola, black currant, bilberry, maqui berry, lingonberry, yumberry and baobab are some others. Retailers and consumers will continue to look for more new and more effective products. If new products deliver more advantages than the older ones, then naturally the new products will be adopted.

At present, goji berry is getting a lot of attention for new product development, but ingredients that offer multiple antioxidant benefits will have more selling potential. Research on seabuckthorn clearly shows that it is a true super fruit, with multiple benefits. A lot of fruits like acerola can provide natural vitamin C. Compounded benefits make the delivery systems easier to sell in the retail trade.

Maqui berry (*Aristotelia chilensis*), also known as Chilean wineberry, could reach a level of popularity close to that of acai. It is native to the Patagonia region of Argentina and Chile. A recent study that was done showed that maqui berry was better for total free-radical-trapping potential and antioxidant reactivity through *in vitro* antioxidant capacity tests as compared to other commercial berries. Another study showed the presence of anthocyanin content and polar polyglycosylated derivatives.

Anthocyanin gives many fruits and vegetables their colour like red, blue and purple. Researchers have been studying this class of polyphenolic antioxidants in areas like brain functioning, dementia and aging, to uncover specific receptor sites in the brain. New Zealand offered a new raw material from OptiPure: blackcurrant powder. A lot of care has been taken to conduct research and develop varieties of blackcurrant, having improved nutritional advantages. As a result of this, blackcurrant from New Zealand has some of the highest anthocyanin levels in the world. After anthocyanin, carotenoids represent one of the widespread groups of naturally available pigments. Carotenoids give fruits and vegetables their colours like red, yellow and orange. Lycopene, beta-carotene, zeaxanthin and astaxanthin are the most abundant and their position in the antioxidant category remains healthy.

A corporation recently launched another unique fruit called Saberry, which is a natural extract from *Emblica officinalis* (Amla). Amla is a super fruit from the Ayurvedic tradition. It is pickled and preserved for its various health food benefits and is used in the Ayurveda as a 'rasayana' or tonic in many compositions to support health and wellness. Amla extracts that were conventionally used were standardized using ascorbic acid as the biomarker. But research has now revealed that Amla does not contain ascorbic acid in consistent amounts and sometimes only in trace quantities. Hence making its validity as a biomarker is doubtful. Saberry is the result of efforts to prepare an authenticated Amla extract, standardized using a valid biomarker called beta- glucogallin. Studies done in-house revealed that it is a more powerful antioxidant molecule than ascorbic acid.

Antioxidants that have been derived specifically from berries have been publicized as having especially high potency. Pterostilbene, a naturally occurring polyphenol that belongs to the group stilbenoids, is chemically related to resveratrol, a potent antioxidant found in red grapes, with clinical evidence supporting its ability to maintain heart health. Pterostilbene is found in many berries, including blueberries, grapes and deerberry. Studies have shown that it has anti-hyperlipidemic properties that reduces low-density lipoprotein (LDL) cholesterol and increases high-density lipoprotein (HDL) cholesterol. It has also been shown that it can lower the blood glucose levels in streptozocin-induced hyperglycemic rats.

## **Tried and Trusted**

Even though there has been a lot of hype recently about the newest fruit from foreign lands, some of the well established, trusted and well known containing antioxidant compounds, including cranberry and blueberry, still hold a strong position in today's market due to familiarity and efficacy. With new research being introduced on the goodness of blueberries, its popularity is growing continuously. Blueberries certainly represent healthy and delicious eating. In a book *Fourteen foods that will change your life*- Dr. Steven Pratt called blueberries "Brainberries". This was with reference to animal studies in which researchers suggested that blueberries helps protect the brain from oxidative stress and may reduce the effects of age-related issues.

More specifically these studies suggest that blueberries have powerful effects on cognition and memory. Also a study done on mice with Alzheimer's disease-like symptoms, showed less cognitive impairment when fed blueberry supplemented diets (2%) of the control diet, over a 12-14 month period, as compared to similar mice, fed the control diet. Even though the exact mechanisms by which these plant-derived molecules affect the brain are not known, it is believed that they affect learning and memory by enhancing neuronal (brain cell) connections. It also makes cellular communications better and stimulates neuronal regeneration. Both the short-term and long-term memory enhancement is controlled at the molecular level in neurons. Until human testing is done, scientists cannot tell whether human supplementation of blueberries can help overcome genetic predispositions to Alzheimer's disease. Till then research using laboratory animals will continue.

Antioxidant defence related to cognition has been a subject of many recent studies. Some researchers concluded that people suffering from Huntington's disease (HD); a neurological disorder characterized by involuntary movement, cognitive disturbance and dementia, could benefit from antioxidants. This was after comparing protein levels in brain samples obtained from post mortem of people affected by HD and control patients who died for other reasons. People affected by HD had higher levels of proteins in their brain tissue that eliminates reactive oxygen species (ROS) or free radicals, as measured by bidimensional electrophoresis techniques. In normal conditions, there is a balance between ROS generation and antioxidant systems, allowing cells to function properly. During oxidative stress, the generation of ROS exceeds cell defence capacity.

Researchers concluded that therapeutic strategies based on boosting antioxidant defense or preventing the formation of ROS could help halt or slow the progression of HD.

Now research is mainly focused on evaluating the effect of oxidative stress arising from metabolic events after eating. Oxidative stress is generally associated with proatherogenic and pro-inflammatory events leading to chronic diseases. Whereas, memory impairment is seen in adults with type 2 diabetes, with higher deficits after eating. It was reported recently that by consuming 1000 mg vitamin C and 800 IU vitamin E along with a fat meal, minimized meal-induced memory impairment in adults with type 2 diabetes mellitus. This suggests oxidative stress to be a potential contributor to meal-induced memory deficits. This exciting field of research deserves greater evaluation.

Cranberry has also become a trusted antioxidant source, which has clinically validated health advantages. Cran-Max, a signature berry antioxidant in a newly expanded BerryMax line, demonstrates its true efficacy in bladder and urinary tract health. Research also supports its greater effectiveness in preventing the recurrence of urinary tract infections, as compared to top antibiotic drugs. Antioxidants with their condition-specific benefits, appeal greatly to consumers. The large number of antioxidants and new entries will ask for better product differentiation. Ingredients that are condition-specific correspond to consumer needs and can help them maintain good health naturally. For example, CranPure; a cranberry extract with high potency is a high antioxidant product but its success is because it is condition-specific for urinary tract health.

## **Setting the table**

Super fruits represent the flashy and hip antioxidant source whereas; vegetables are the strong and silent type. But now vegetables are gaining more importance. Vegetables are not as high as fruits are in ORAC (Oxygen Radical Absorbance Capacity) assays. They are however powerful stimulators of our endogenous antioxidant system and required components to sound nutrition and prevention. Phytonutrients like sulforaphane, found in cruciferous vegetables and sprouts are strong stimulators of phase 2 proteins and our endogenous antioxidant system. Now a 'superveg' trend is emerging with ingredients like broccoli, bell peppers and purple carrots.

Some product developers have tried to get the best of both by introducing fruit and vegetable juice blends. Many key vegetable ingredients in processed form can provide important nutrients and antioxidants that appeal to the consumer's tastes. While, users of vegetable portions mostly concentrate on low costs, good taste and name recognition (carrot or tomato), developers have a good chance to incorporate vegetable ingredients that provide unique phytochemicals, with some effort on flavour masking.

With the good position given to functional foods and beverage formulas by traditional food supplements and the growing consumer understanding of the availability of antioxidants from fruits and vegetables, the application is seeing a continuous rise in demand. Now shoppers can find foods and beverages enriched with antioxidants instead

of buying antioxidant powders, capsules or ready-made drinks. The number of antioxidant-rich products has been increasing in foods, beverages and personal care.

To use natural antioxidants as nutricosmetics and cosmeceuticals to improve skin health and appearance has become a popular trend. The cosmetic industry boasts of the presence of antioxidants in their formulas for face, body and hair care products. They are also making claims like 'anti-wrinkle' and 'fights sun damage'. The average user of antioxidants is said to be 50 years old, which shows that the demand for products that reduce natural effects of ageing will continue to grow.

As the human body grows older, it fails to produce compounds that are needed for healthy cells. For this, CoQ10 has come out as a very popular and fast growing supplement in the U.S. CoQ10 is associated with energy by many because of its role in cellular respiration. However, to function properly it needs to be converted into ubiquinol (its active antioxidant form). Ubiquinol, an important nutrient, should be seriously considered for good health, longevity and vitality. Most young and healthy people can efficiently metabolize CoQ10 (ubiquinone) and convert it to ubiquinol. Only ageing and certain disease states reduce the production of CoQ10 and the body's ability to convert it.

Soft Gel's CoQH-CF, contains Kaneka QH, which provides a stable and protected form of ubiquinol. This is specifically for people over 40 and those with certain diseases and symptoms of lifestyle and related conditions like stress, fatigue, lack of stamina etc. it is also very important for persons with conditions of extreme oxidative stress, diabetics and liver diseases.

Resveratrol has also become a notable antioxidant. It is also gaining popularity in the health food industry and it being publicized for its anti-aging effects, antioxidant, anti-inflammatory and anti-microbial properties. Research has suggested the potent antioxidant properties in muscadine grapes (*Vitis rotundifolia*), which are grown throughout southeastern U.S. due to which there has been growing interest in them. The wine derived from these grapes gives five times more resveratrol than some ordinary wines (more than 40 mg/L compared to between 0.2 and 5.8 mg/L).

Grapes have proven to be a powerful seller among consumers. Clinically tested and trademarked plant extracts that have been standardized to specific active compounds have a very high demand. Powergrape for example is a branded ingredient for energy and anti-aging food applications, which is a unique concept backed by clinical trials. It is known to improve performance and capacity to recover by greatly improving the antioxidant status of supplemented athletes.

A company's MegaNatural-BP grape seed extract- polyphenolics, has also seen significant growth as it maintains healthy blood pressure already within the normal range and helps protect serum components against oxidation. Another phytonutrient that is gaining popularity is a company's branded and patented Curcumin C3 Complex, supported by clinical studies that show its ability to prevent inflammation and age-related

conditions. At a basic level phytonutrients like quercetin and curcumin have shown to up-regulate antioxidant gene expression in animal models.

## **Marketing and Education**

Antioxidants are not that convincing unless their benefits are proven by clinical trials. Hence Pycnogenol is a Clinically Evidence Based Antioxidant as it has more than 40 years of research and 220 scientific publications to support it. A generic antioxidant benefit does not satisfy consumers; they need verifiable data proving the health benefits.

Antioxidants can easily make space for themselves on the shelf but they will last only if they have enough evidence to support them. For example there was a beauty product that had green tea-derived antioxidants, but it failed in the market due to insufficient clinical research on green tea driven clinical research on skin care. The future cannot be predicted but it is known that ingredients and finished products relying on health claims are facing lot of difficulties. Whereas those backed by clinical research are doing pretty well.

Any new ingredient or product might enjoy initial success since antioxidants are becoming well known, but not for long, as the economy and its uncertainty will take a toll over it. People with lesser money to spend will want to know that they are buying the product for a reason and will demand clear-cut and good answers. Without good research to support the product, consumers will be doubtful about buying it. Educating people about antioxidants and the science behind it is very difficult, as you need to understand cellular chemistry and physiology, which is extremely complex. Antioxidants have been publicized by marketers as something that protects the body against oxidative damage caused by free radicals. To properly promote these basic nutrients, you need to have scientific based evidence and present it in a simple and understandable manner.

With greater understanding consumers become more selective in their purchases. So for this, end producers, from time to time, will have to communicate the targeted benefits, the active compound content and the proven efficacy. Only labeling the products 'antioxidants' is not good enough, since they provide several health benefits. Food marketers get lot of directions to work in, including cardiovascular health, immune support and skin health. Differentiation of products has become the driving force for research into condition-specific health benefits. Consumers will want to relieve any and all conditions with the use of antioxidants that will provide health benefits. These conditions need to be understood and substantiated to know what specific benefits it can provide.

Astaxanthin is another example of an antioxidant that has sufficient clinical evidence. A lot of research has been done on its potential benefits in areas like cardiovascular/hypertension, gastric, skin, muscle endurance, fat reduction, diabetes, asthenopia (eye fatigue), inflammation, nephropathy, immunomodulation and fertility. It has the ability to neutralize the effects of active oxygen it interrupts that cascading process of cell damage on the way to ill health.

According to a survey done, most antioxidant users are managing or treating their conditions. The top health and medical conditions included the need to lose weight, for appearance (47%) or health reasons (38%), concentration problems (38%), lactose intolerance (33%), seasonal allergies (32%), immune problems (31%) and anxiety (30%). Antioxidant users also use a lot of supplement products. For example, 45% take omega 3s compared to just 9% of non-users and 33% take fibre supplements versus 8% of non-users. They also use a lot of supplements for immune support, joint health and heart health.

A specific and simple strategy is the perfect way to market antioxidants. Setria is a good example demonstrating this. It is a premium form of glutathione and is marketed as 'The Morning Antioxidant' which makes a lot of sense as glutathione levels are the lowest in the morning, when oxidative stress is at its highest. For this, supplementing with Setria is the best thing to do in the morning. Setria glutathione acts as a powerful antioxidant, a detoxifier for pollutants, carcinogens and heavy metals and an immune supporter, by helping recycle vitamins E and C.

## **Research and Beyond ORAC**

It could be difficult to find capital to invest in scientific research, in today's economic environment. However, experts say that clinical studies could pay dividends. For long-term success in the market, research needs to directly convey the health and wellness benefits. As more is invested in developing research, the attractiveness of these ingredients will increase further.

Now the debate continues on what forms a valid measurement of antioxidant activity. Previously ORAC mostly asked for scientific backing for an antioxidant product, but now ORAC value has become a race to claim the highest value. ORAC helps in partly determining the measurement of antioxidant activity. To find the accurate value biologically relevant assays need to be used. A study was recently completed involving Oxyphyte product line to confirm bioavailability and antioxidant potency at the cellular level using the CAP-e (Cell-based Antioxidant Protection in Erythrocytes) assay.

Some scientific experts are being very stringent about the current testing methods. A consultant, having years of experience in research, in physiological and scientific publishing said that ORAC is physiologically meaningless; it is only a test-tube phenomenon. The author of a book about super fruits for consumers discussed the current state of antioxidant research. He said that there isn't enough evidence to confirm that plant-derived polyphenols have important antioxidant effects in vivo. Adequate physiological models for antioxidant activity of polyphenols do not exist. There has been no significant research progress on this topic, and no significant advancement in the physiology of polyphenols as antioxidants can occur until this is solved.

Biochemical systems work at various levels in maintaining optimal oxidative status. ORAC doesn't pick up all those levels. People probably don't realize that all antioxidants are not treated equally when it comes to optimizing oxidative status or working within the

variety of levels that are present within human cells. Antioxidants penetrate different levels of biochemical systems and hence don't function equivalently.

To evaluate the potential impact on targeted health conditions, researchers will keep identifying specific dietary ingredients. ORAC will continue to remain a key assay in determining the power of antioxidants even though it does not prove efficacy and cannot indicate bioavailability as it has been a main factor in growing important health ingredients like fruits and teas containing high catechin levels. Now research to determine the functionality of products in vivo is emerging. This will be very important for formulators trying to develop condition-specific antioxidant products.

A program called TargeTest is trying to evaluate bioavailability and specific bioactivity of antioxidants in vivo. Research has shown that certain antioxidants have a targeted influence on enzymes residing in the blood and that inhibition or activation of these enzymes can potentially modulate inflammation. It is widely accepted that silent inflammation often precedes tangible symptoms of disease. Controversy remains over how antioxidants exactly work in our body and if they actually make any difference to our natural defense networks. They do have health benefits but through targeted mechanisms. Recent interest has been focusing on cell signaling pathways and DNA transcription factors.

Finally, antioxidants cannot be confined to only one mechanism of action. One realization is that inflammation plays an important role in many chronic diseases. Also lot of interest is being taken in investigating anti-inflammatory effects of flavonoids. Future health claims could focus more on this aspect, as it better reflects biological activity and is more relevant to prevention of diseases. On the whole, researchers admit that it could take a few years till human clinical trials confirm antioxidants to be physiological nutrients that have specific effects on organ tissues, which will support the health claims made.

Supplying these compounds in a variety of forms and applications will have to be done by innovators who can produce such products, despite all the obstacles that currently exist.

***Extracted from an article by Sean Moloughney in Nutraceuticals World March 2009  
by Sonia Khudanpur***



## Nutrition News

### Review Identifies Dietary Factors Associated With Heart Disease Risk

A review of previously published studies suggests that vegetable and nut intake and a Mediterranean dietary pattern appear to be associated with a lower risk for heart disease, according to a report published in the April 13 issue of *Archives of Internal Medicine*, one of the JAMA/Archives journals. However, intake of trans-fatty acids and foods with a high glycemic index may be harmful to heart health.

“The relationship between dietary factors and coronary heart disease has been a major focus of health research for almost half a century,” the authors write as background information in the article. Although “a wealth of literature” has been published on the topic, “the strength of the evidence supporting valid associations has not been evaluated systematically in a single investigation.”

Andrew Mente, Ph.D., of the Population Health Research Institute, and colleagues conducted a systematic search for articles investigating dietary factors in relation to heart disease published between 1950 and June 2007. A total of 146 prospective cohort studies (looking back on the habits of a particular group of individuals) and 43 randomized controlled trials (where participants are randomly assigned to a dietary intervention or a control group) were identified and included in the systematic review.

When the researchers pooled the study results and applied a predefined algorithm, “we identified strong evidence of a causal relationship for protective factors, including intake of vegetables, nuts and monounsaturated fatty acids and Mediterranean, prudent and high-quality dietary patterns, and harmful factors, including intake of trans-fatty acids and foods with a high glycemic index or load and a western dietary pattern,” they write. “Among these dietary exposures, however, only a Mediterranean dietary pattern has been studied in randomized controlled trials and significantly associated with coronary heart disease.”

In addition, modest relationships were found supporting a causal relationship between intake of several other foods and vitamins and heart disease risk, including fish, omega-3 fatty acids from marine sources, folate, whole grains, alcohol, fruits, fiber and dietary vitamins E and C and beta carotene. Weak evidence also supported causal relationships between vitamin E and ascorbic acid supplements, saturated and polyunsaturated fatty acids and total fats, alpha-linoleic acid, meat, eggs and milk.

“The modest or weak evidence of these dietary exposures is mostly consistent with the findings of randomized controlled trials, although randomized controlled trials have yet to be conducted for several factors,” the authors write. “Taken together, these findings support a causal relationship between only a few dietary exposures and coronary heart disease, whereas the evidence for most individual nutrients or foods is too modest to be conclusive.”

“Although investigations of dietary components may help to shed light on mechanisms behind the benefits of dietary patterns, it is unlikely that modifying the intake of a few nutrients or foods would substantially influence coronary outcomes,” they conclude. “Our findings support the strategy of investigating dietary patterns in cohort studies and randomized controlled trials for common and complex chronic diseases such as coronary heart disease.”

**(Arch Intern Med. 2009;169[7]:659-669) From: News Wise April 9, 2009**

## **Experts Lay to Rest Long-Held Misconceptions about High Fructose Corn Syrup**

**Summary:** The conference experts concluded that studies testing pure fructose at levels not seen in the typical diet are simply misleading in terms of understanding the metabolism of high fructose corn syrup.

A supplement to be published in the June issue of the Journal of Nutrition encourages the scientific community and the general public to stop demonizing high fructose corn syrup as the culprit of obesity and to rethink the myths about high fructose corn syrup's impact on the American diet. "The State of the Science on Dietary Sweeteners Containing Fructose" is the scientific summary of a joint conference held in March 2008 by the International Life Sciences Institute of North America and the U.S. Department of Agriculture, Agricultural Research Service. Several scientific papers from the supplement are currently available online.

The conference brought together several scientific leaders from varying backgrounds, including former critics of high fructose corn syrup, who found there is little evidence that high fructose corn syrup and sugar (or sucrose) have differing effects on satiety, overall energy balance, metabolic hormones or biochemical metabolites such as triglycerides and uric acid – all suggesting no unique causal role for high fructose corn syrup in obesity.

According to Suzanne P. Murphy, Ph.D., R.D., research professor at the Cancer Research Center of Hawaii, University of Hawaii, noted in her summary of the presented papers, "...[high fructose corn syrup] and sucrose are similar and one is not 'better or worse' than the other." Dr. Murphy notes that "it does not appear to be practical to base dietary guidance on selecting or avoiding these specific types of sweeteners."

### **High Fructose Corn Syrup Is Not the Same as Fructose**

Confusion about high fructose corn syrup has been fueled in part by erroneous links to research testing high levels of pure fructose, and then generalizing those findings to high fructose corn syrup. The conference experts concluded that studies testing pure fructose at levels not seen in the typical diet are simply misleading in terms of understanding the metabolism of high fructose corn syrup. High fructose corn syrup never contains fructose alone. Rather, just like sugar, high fructose corn syrup is comprised of roughly equivalent

amounts of fructose and glucose.

"These peer-reviewed papers expose the confusion about high fructose corn syrup: it is a case of mistaken identity between two sweeteners," said Audrae Erickson, president of the Corn Refiners Association. "High fructose corn syrup is not high in fructose, but rather has roughly half fructose and half glucose, just like sugar – therefore, it should come as no surprise that high fructose corn syrup and sugar are metabolized the same way in our bodies."

### **Increased Caloric Intake, Not a Single Sweetener, the Likely Cause of Obesity**

Fructose-containing sweeteners— such as sugar, invert sugar, honey, fruit juice concentrates and high fructose corn syrup—are essentially interchangeable in composition, calories and metabolism. Replacing high fructose corn syrup in foods with other fructose-containing sweeteners will provide neither improved nutrition nor a meaningful solution to the obesity crisis. "In light of similarities in composition, sweetness, energy content, processing and metabolism, claims that such sweetener substitutions bring nutritional benefit to children and their families appear disingenuous and misleading," concluded John S. White, Ph.D., caloric sweetener expert and president of White Technical Research.

Since the introduction of high fructose corn syrup 35 years ago, calories from added sugars (mostly sucrose and high fructose corn syrup) increased at a slower rate than calories from all sources. With high fructose corn syrup use in decline since 1999, it is far more likely, writes Dr. White, that this increase in total calories was due to Americans eating more of everything.

White urges more care in interpreting experimental data that claim to demonstrate metabolic effects for fructose-containing sweeteners. "It is inappropriate to extrapolate experimental outcomes derived from pure fructose or pure glucose, or from experiments in which fructose exceeds 10% of total energy," wrote White. "The misinterpretation of such studies as cautions against moderate dietary fructose and high fructose corn syrup use is simply not justified."

### **Growing Body of Evidence**

The American Medical Association in June 2008 helped put to rest a common misunderstanding about high fructose corn syrup and obesity, stating that "high fructose syrup does not appear to contribute to obesity more than other caloric sweeteners." Even former critics of high fructose syrup dispelled myths and distanced themselves from earlier speculation about the sweetener's link to obesity in a comprehensive scientific review published in the December 2008 American Journal of Clinical Nutrition.

**From: Nutrition Horizon 28 Apr 2009**



## Research in Food & Nutrition

### **ADA: Functionals a good thing — but more research and education are required**

Functional foods can benefit health when consumed as part of a varied diet — but further research and consumer education are required, according to a new position paper from the Chicago-based American Dietetic Association.

The ADA, a member organisation representing 68,000 food and nutrition professionals, published the position in the April issue of the *Journal of the American Dietetic Association*.

It states: "All foods are functional at some physiological level, but it is the position of the American Dietetic Association that functional foods that include whole foods and fortified, enriched or enhanced foods have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at effective levels.

"ADA supports research to further define the health benefits and risks of individual functional foods and their physiologically active components. Health claims on food products, including functional foods, should be based on the significant scientific agreement standard of evidence and ADA supports label claims based on such strong scientific substantiation.

"Food and nutrition professionals will continue to work with the food industry, allied health professionals, the government, the scientific community and the media to ensure that the public has accurate information regarding functional foods and thus should continue to educate themselves on this emerging area of food and nutrition science."

The paper includes definitions of the term as used in different countries and notes that 'functional foods' is not a legal term but a marketing term. The ADA defines functional foods as those which "move beyond necessity to provide additional health benefits that may reduce disease risk and/or promote optimal health. Functional foods include conventional foods, modified foods (fortified, enriched or enhanced), medical foods and foods for special dietary uses."

The position statement was written by Clare Hasler, executive director of the Robert Mondavi Institute for Wine and Food Science at the University of California — Davis, and Amy Brown from the Department of Complementary and Alternative Medicine at the University of Hawaii's John A Burns School of Medicine.

The paper on concludes: "The study of how diet impacts disease prevention and health promotion is more important than ever. Consumer interest in the health benefits of foods

and food components is at an all-time high and will continue to grow. Food and nutrition professionals are uniquely qualified to interpret scientific findings on functional foods and translate such findings into practical dietary applications for consumers, other health professionals, policy makers and the media. Food and nutrition professionals must continue to be leaders in this exciting and ever-evolving area of food and nutrition."

**From: Functional Ingredients April 14, 2009**

### **Pomegranate Juice may Slow and Prevent Prostate Cancer**

New research shows that men treated for localized prostate cancer may benefit from drinking pomegranate juice. Results of a long-term study show that men who drank eight ounces of pomegranate juice daily had slower progression of untreatable localized prostate cancer. Researchers compared 48 men with prostate cancer enrolled in the stage 2 clinical trial, following the men for six years. The group of men had undergone either surgery or radiotherapy for prostate cancer. Criteria for entrance into the study included PSA above 0.2 ng/ml and less than 5 ng/ml and a Gleason score of 7 or less.

At the start of the study, all of the men showed increased PSA levels. During the six-year follow-up, men who remained active in the study, consuming pomegranate juice, showed slower progression of prostate cancer, evidenced by lower PSA levels. Christopher Amling, MD, an American Urological Association spokesperson says, "This study suggests that pomegranate juice may effectively slow the progression of prostate cancer after unsuccessful treatment. This finding and other ongoing research might one day reveal that pomegranate juice is an effective prostate cancer preventative agent as well."

Phase 3 trials are underway to determine if pomegranate juice is more effective for slowing prostate cancer in some men than others. The researchers say parts of the study suggest that some men are more sensitive to the effects of pomegranate juice on decreasing PSA doubling time. The phase 3 trial will compare pomegranate juice to placebo to clarify the effects of pomegranate juice on slowing and possibly preventing prostate cancer. *J Urol*, suppl. 2009: 181, 4, abstract 826.

**From: EMax Health April 28, 2009**

### **Researchers develop transgenic multivitamin corn**

Researchers from Spain and Germany have developed transgenic corn that contains high amounts of beta-carotene, ascorbate, and folate. Vitamin deficiency affects up to 50% of the world's population, disproportionately affecting developing countries where populations endure monotonous, cereal-rich diets. Transgenic plants offer an effective way to increase the vitamin content of staple crops, but thus far it has only been possible to enhance individual vitamins. The researchers created elite inbred South African transgenic corn plants in which the levels of three vitamins were increased specifically in the endosperm through the simultaneous modification of three separate metabolic pathways. The transgenic kernels contained 169-fold the normal amount of beta-carotene,

6-fold the normal amount of ascorbate, and double the normal amount of folate. Levels of engineered vitamins remained stable at least through to the T3 homozygous generation. The researchers believe that this achievement will open the way for the development of nutritionally complete cereals to benefit the world's poorest people.

The research is published in the *Proceedings of the National Academy of Sciences*.

**IFT Newsletter April 29, 2009**

### **Insufficient vitamin D may increase asthma, allergies in children**

A study published in the *American Journal of Respiratory and Critical Care Medicine* shows that lower vitamin D levels may be associated with increased markers of allergy and asthma severity. The researchers examined the association between vitamin D levels and markers of asthma severity and allergy in 616 asthmatic children, age 6–14, from Costa Rica. Twenty-one children, or 3.4%, had blood levels of the vitamin D metabolite 25-hydroxyvitamin D considered to be “deficient” and an additional 152, or 24.6%, had vitamin D levels considered “insufficient.” The researchers found that lower levels of vitamin D were associated with increased odds of being hospitalized for asthma, increased airway “twitchiness,” and more severe allergies. The researchers noted that the role of vitamin D in the development of asthma is still unknown. In addition, it is unknown whether vitamin D supplementation would be beneficial in the prevention or treatment of asthma.

**IFT Newsletter April 29, 2009**

### **Fortified Juice Effective in Raising Kids' DHA Levels**

Supplementation with DHA-fortified juice effectively increased plasma phospholipid DHA content in children, according to a recent study published in the *Journal of the American Dietetic Association*. The study randomly assigned 31, 4- to 12-year-olds to drink orange juice fortified with microencapsulated algal DHA at either 50 mg or 100 mg DHA per day for six weeks. Because there are no data for plasma phospholipid DHA content in healthy children, data were compared to that of breastfed infants. At baseline, plasma phospholipid DHA content was lower in both dose groups than was observed in breastfed infants. It increased significantly in both dose groups, but more so in the higher dose group, reaching levels similar to or greater than content of breastfed infants. While children in both groups showed increased DHA blood levels, researchers did not pinpoint specific health benefits. However, DHA is believed to play an important role in early brain and eye development. Many experts acknowledge that most children do not meet the recommended guidelines for fish intake that would provide DHA. Researchers concluded that DHA-fortified juice is a realistic means of increasing the amount of DHA in a child's diet.

**From: Nutraceuticals World April 27, 2009**



## Regulatory News

### Expanded recall of Union International spices

The U.S. Food and Drug Administration (FDA) is alerting the public to the expanded, voluntary recall by Union International Food Company, Union City, Calif., of sauces, oils, and oil blends sold under the *Uncle Chen* and *Lian How* brands. The expanded recall is based on the investigation into the ongoing foodborne illness outbreak of *Salmonella* Rissen. It is in addition to the recall announced last month by the company of its dry spice products. The sauces, oils, and oil blends being recalled were distributed under the *Uncle Chen* and *Lian How* brands to retailers, wholesalers, distributors, and restaurants in the states identified to date of Ariz., Calif., Nev., Ore., S.Ca., Texas, Utah, Wash., and Wis. The products were sold in containers ranging from 6 oz to 1 gal in plastic or glass bottles and are used, for example, as spices and seasonings for cooking and as table top meal seasonings.

The company has stopped the production and distribution of these products as the FDA, the Calif. Dept. of Public Health, and Union International continue their investigations. To date, 57 cases of illness caused by *Salmonella* Rissen have been reported, mostly in the western region of the U.S.

**IFT Newsletter April 22, 2009**

### FDA Calls Meeting to Tackle Adulteration

The US Food & Drug Administration is to host a public meeting to address the problem of economically motivated adulteration (EMA) of food, supplements and drugs.

In an invitation to the event, to be held on 1 May, the agency says: "Several recent incidents involving FDA-regulated products are suspected to be examples of EMA. These incidents illustrate the potential for serious public health harm from such adulterated products."

The FDA lists a series of cases where EMA is suspected, including last year's contamination of Chinese milk products with melamine.

It adds: "Despite longstanding FDA requirements to assure the safety of regulated products, such as requirements for the use of ingredients of known identity and quality in drugs, economically motivated adulteration remains a public health threat."

Interested parties are invited to come to the meeting to present "information pertaining to predicting and preventing EMA of food (including dietary supplements and animal food), drugs, medical devices, and cosmetics." The agency also says comments can be submitted to the public docket.

Defining EMA, the FDA says: "For purposes of this public meeting, FDA proposes a working definition of EMA as the fraudulent, intentional substitution or addition of a substance in a product for the purpose of increasing the? apparent value of the product or reducing the cost of its production, ie for economic gain.

"EMA includes dilution of products with increased quantities of an already-present substance (e.g., increasing inactive ingredients of a drug with a resulting reduction in strength of the finished product, or watering down of juice) to the extent that such dilution poses a known or possible health risk to consumers, as well as the addition or substitution of substances in order to mask dilution."

**From: Functional Ingredients April 2009**

### **Codex committee on food additives**

The 41st Session of the Codex Committee on Food Additives (CCFA) was held in Shanghai, China on March 16–20, 2009. The committee was very productive with several documents moving forward for adoption by the 32nd Codex Alimentarius Commission including: food additive provisions for the General Standards for Food Additives (GSFA); amendments to the International Numbering System; and specifications for the Identity and Purity of Food Additives arising from the Joint FAO/WHO Expert Committee on Food Additives (JECFA) 68th meeting (i.e., 20 additives including carob bean and guar gum, phytosterols and steviol glycosides, and 105 flavorings). Several substances such as pullulan and flavorings (315 of them) were proposed for evaluation by JECFA. CCFA discontinued work on several provisions for a number of food additives such as acesulfame potassium, alitame annatto extracts, lycopenes, carotenoids, etc. (see report for full list) due to lack of technological justification for use. Category 16 (Composite Foods) of the GSFA was maintained for the time-being on the basis that products in the category may need additives. However, product examples and technological justification are needed for the category to stay on. For further details please refer to the full reports available on the Codex website.

**IFT Newsletter April 22, 2009**

### **Guidance on prior notice rule for food imports**

The U.S. Food and Drug Administration's (FDA) Dept. of Health and Human Services has published a guidance document on the prior notice rule for small companies involved with the import and export of foods in the U.S. The document offers an update on the prior notice interim final rule issued under the 2002 Bioterrorism Act, which was published in the *Federal Register* in November, after it was discovered that it would prove too costly for small companies. This guide is intended to help any entity, regardless of size, to comply with the regulations that require the submission to FDA of prior notice

of food, including animal feed, that is imported or offered for import into the U.S. Now FDA is allowing longer for importers to inform it of food product imports, extending the window for doing so from the current five days before arrival to 15 or 30 days, depending on the mode of notification. The amended regulations go into effect on May 6.

**IFT Newsletter April 29, 2009**

### **Apeda issues new norms for mango exports**

India has issued fresh guidelines for mango exporters in the current season to minimize the rejection of fruit consignment by the US on quality grounds. Agricultural and Processed Food Products Export Development Authority (APEDA) has issued a circular asking exporters to take precautionary measures to ensure that mangoes sent for irradiation are free from any kind of contamination or injury.

Exported mangoes go through a process of irradiation that has been made mandatory by the US last year to allow the Indian fruit to its territory. "This is an effort to ensure that the quality of fruits is of high standard and no complaints, rejections are reported," APEDA general manager RK Boyal said in the circular. He has warned that any complaints, rejections would be treated seriously. Exporters and packhouses must comply with the Standard Operating Procedures (SOPs) when they export mangoes to the US, he added.

Under SOPs, a packing house facility engaged in processing of the fruit should be registered with APEDA if it wants to export mangoes to the US. The packing house will have to enter into a compliance agreement with APEDA and irradiation treatment facility currently located at Nasik.

APEDA said registered packing house will have to source mangoes from orchards which are registered with it. It will have to maintain specific records of fruit arrival, processing and shipping to ensure reliable system for trace back of a consignment to a particular orchard. The registered packing house facility will submit a list of orchards registered with it to APEDA and other agencies including animal plant health inspection service of US department of agriculture. The guidelines also mentioned that the registered orchards will maintain record of all operations carried out at the orchard and adopt good agricultural, horticultural practices in raising the orchard.

**THE ECONOMIC TIMES, Kolkata, 28.04.2009**

## **Diet Affects Diversity of Microbes in Human Gut, and in turn, Colon Cancer Risk**

A typical Western diet, rich in meat and fats and low in complex carbohydrates, is a recipe for colon cancer, Professor Stephen O'Keefe from the University of Pittsburgh, USA, told the Society for General Microbiology meeting at Harrogate 31 March. He described an expanding body of evidence to show that the composition of the diet directly influences the diversity of the microbes in the gut, providing the link between diet, colonic disease and colon cancer.

People eating a healthy diet containing high levels of complex carbohydrate had significant populations of micro-organisms in their gut called Firmicutes. These bacteria use the undigested residues of starch and proteins in the colon to manufacture short-chain fatty acids and vitamins such as folate and biotin that maintain colonic health. One of these fatty acids, butyrate, not only provides most of the energy to maintain a healthy gut wall, but it also regulates cell growth and differentiation. Both experimental and human studies support its role in reducing colon cancer risk.

However, gut microbes may also make toxic products from food residues. Diets high in meat will produce sulphur - this decreases the activity of 'good' bacteria that use methane and increases the production of hydrogen sulphide and other possible carcinogens by sulphur-reducing bacteria.

"Colon cancer is the second leading cause of cancer-related deaths in adults in Westernized communities." said Professor O'Keefe, "Our results suggest that a diet that maintains the health of the colon wall is also one that maintains general body health and reduces heart disease".

"A diet rich in fibre and resistant starch encourages the growth of good bacteria and increases production of short chain fatty acids which lessen the risk of cancer, while a high meat and fat diet reduces the numbers of these good bacteria." Professor O'Keefe went on. "Our investigations to date have focused on a small number of bacterial species and have therefore revealed but the tip of the iceberg, our colons harbour over 800 bacterial species and 7,000 different strains. The characterization of their properties and metabolism can be expected to provide the key to colonic health and disease".

**Science Daily (Apr. 2, 2009)**

## Low glycemic breakfast may increase benefits of working out

**The benefits of physical activity and a balanced diet are well documented and form the basis of many public health recommendations. This is because each of these factors can independently influence risks for many chronic diseases such as obesity, type 2 diabetes, and some forms of cancer.**

Some research also suggests that exercise and diet interact to influence health. For instance, exercising after short-term fasting (such as before breakfast) may increase the amount of **fat** burned. Similarly, consumption of a meal eliciting a low blood glucose response prior to exercise may also boost the use of body fat (instead of glucose). However, most of these studies have used either trained athletes or recreational exercisers, and none has looked at effects of the type of pre-exercise meal on metabolism during and after exercise.

To better understand the effects of pre-exercise meal composition on fat metabolism in more typical (sedentary) individuals, a group of researchers headed by Dr. Emma Stevenson at the University of Nottingham conducted a controlled human intervention trial. The results of their study are published in the May 2009 issue of *The Journal of Nutrition*.

As expected, blood glucose concentrations were higher after the HGI than the LGI meals and had returned to baseline levels by the time exercise was commenced, after which they were not influenced by breakfast type. Plasma free fatty acids (FFA; a marker for adipose oxidation) fell after consumption of both HGI and LGI breakfasts, but began to rise at ~2 h post-breakfast in the LGI (but not HGI) treatment. Exercise caused a rapid increase in FFA in both groups, but this was higher in the LGI trial compared to the HGI trial ( $P < 0.001$ ). circulating concentrations of ffa were not different between treatments following lunch. overall, fat oxidation was higher in the lgi treatment than in the hgi treatment ( $p < 0.05$ ) during the post-breakfast and exercise periods. following lunch, fullness scores were higher in the lgi trial than in the hgi trial ( $p < 0.05$ ).

The authors concluded that consuming a lgi breakfast increases fat oxidation during subsequent exercise and improved satiety during recovery in sedentary females. as such, individuals trying to shed fat may consider choosing lgi foods eaten prior to when they **exercise**.

**Source: American Society for Nutrition**

**From: PhysOrg.com April 14th, 2009**

## LSUHSC research shows fish oil protects against diseases like Parkinson's

New Orleans, LA – Dr. Nicolas Bazan, Director of the Neuroscience Center of Excellence, Boyd Professor, and Ernest C. and Yvette C. Villere Chair of Retinal Degenerative Diseases Research at LSU Health Sciences Center New Orleans, will present new research findings showing that an omega three fatty acid in the diet protects brain cells by preventing the misfolding of a protein resulting from a gene mutation in neurodegenerative diseases like Parkinson's and Huntington's. He will present these findings for the first time on Sunday, April 19, 2009 at 10:30 a.m. at the Ernest N. Morial

Convention Center, Nouvelle C Room, at the American Society for Nutrition, Experimental Biology 2009 Annual Meeting.

With funding from the National Eye Institute of the National Institutes of Health, Dr. Bazan and his colleagues developed a cell model with a mutation of the Ataxin-1 gene. The defective Ataxin-1 gene induces the misfolding of the protein produced by the gene. These misshapened proteins cannot be properly processed by the cell machinery, resulting in tangled clumps of toxic protein that eventually kill the cell. Spinocerebellar Ataxia, a disabling disorder that affects speech, eye movement, and hand coordination at early ages of life, is one disorder resulting from the Ataxin-1 misfolding defect. The research team led by Dr. Bazan found that the omega three fatty acid, docosahexaenoic acid (DHA), protects cells from this defect.

Dr. Bazan's laboratory discovered earlier that neuroprotectin D1 (NPD1), a naturally-occurring molecule in the human brain that is derived from DHA also promotes brain cell survival. In this system NPD1 is capable of rescue the dying cells with the pathological type of Ataxin-1, keeping their integrity intact.

"These experiments provide proof of principle that neuroprotectin D1 can be applied therapeutically to combat various neurodegenerative diseases," says Dr. Bazan. "Furthermore, this study provides the basis of new therapeutic approaches to manipulate retinal pigment epithelial cells to be used as a source of NPD1 to treat patients with disorders characterized by this mutation like Parkinson's, Retinitis Pigmentosa and some forms of Alzheimer's Disease."

**From: Eurekalert April 19, 2009**

### **Benefit of Grapes may be more than Skin Deep: Lower Blood Pressure, Reduced Heart Damage**

*New research suggests grapes may prevent heart health risks because of phytochemicals – naturally occurring antioxidants – turning on a protective process in the genes that reduces damage to the heart muscle.*

Can a grape-enriched diet prevent the downhill sequence of heart failure after years of high blood pressure?

A University of Michigan Cardiovascular Center study suggests grapes may prevent heart health risks beyond the simple blood pressure-lowering impact that can come from a diet rich in fruits and vegetables. The benefits may be the result of the phytochemicals – naturally occurring antioxidants – turning on a protective process in the genes that reduces damage to the heart muscle.

The study, performed in laboratory rats, was presented at the 2009 Experimental Biology convention in New Orleans.

The researchers studied the effect of regular table grapes (a blend of green, red, and black grapes) that were mixed into the rat diet in a powdered form, as part of either a high- or low-salt diet. Comparisons were made between rats consuming the grape powder and rats that received a mild dose of a common blood pressure drug. All the rats were from a research breed that develops high blood pressure when fed a salty diet.

After 18 weeks, the rats that received the grape-enriched diet powder had lower blood pressure, better heart function, and fewer signs of heart muscle damage than the rats that ate the same salty diet but didn't receive grapes.

Rats that received the blood pressure medicine, hydrazine, along with a salty diet also had lower blood pressure, but their hearts were not protected from damage as they were in the grape-fed group.

"There are the small changes that diet can bring, but the effect of grape intake on genes can have a greater impact on disease down the road," said E. Mitchell Seymour, M.S., who led the research as part of his doctoral work in nutrition science at Michigan State University. He manages the U-M Cardioprotection Research Laboratory, which is headed by U-M cardiac surgeon Steven Bolling, M.D.

Heart cells, like other cells in the body, make an antioxidant protein called glutathione, which is one of our first defenders against damaging oxidative stress. High blood pressure causes oxidative stress in the heart and lowers the amount of protective glutathione. However, intake of grapes actually turned on glutathione-regulating genes in the heart and significantly elevated glutathione levels.

This may explain why the hearts of grape-fed animals functioned better and had less damage.

Although the current study was supported in part by the California Table Grape Commission, which also supplied the grape powder, the authors note that the commission played no role in the study's design, conduct, analysis or the preparation of the journal article for publication. Seymour also receives funding from the National Heart, Lung and Blood Institute, part of the National Institutes of Health, through a National Research Service Award.

Bolling said the latest results take research on the health benefits of grapes "a step further" by examining the mechanisms impacted by antioxidant-rich grapes.

The rats in the study were from a strain called Dahl rats, which have been specially bred to all be susceptible to salt-induced hypertension. The animals are similar to

Americans who have elevated blood pressure related to diet, and who develop heart failure over time because of prolonged hypertension.

Each group of 12 rats was fed the same weight of food each day with powdered grapes making up 3 percent of the diet (by weight) for rats that received grapes as part of either a low-salt or high-salt diet. The rats that received hydrazine were fed it through their water supply in a dose that has been previously shown to be effective in reducing blood pressure.

Such naturally occurring chemicals have already been shown in other research, including previous U-M studies, to reduce other potentially harmful molecular and cellular activity in the body.

In all, the researchers say, the study further demonstrates that a grape-enriched diet can have broad effects on the development of hypertension and the risk factors that go with it. Whether the effect can be replicated in humans, they say, remains to be seen.

**From: ScienceDaily (Apr. 23, 2009)**

### **Dairy Better For Bones Than Calcium Carbonate**

A Purdue University study shows dairy has an advantage over calcium carbonate in promoting bone growth and strength.

Connie Weaver, distinguished professor and head of the food and nutrition department, found that the bones of rats fed nonfat dry milk were longer, wider, more dense and stronger than those of rats fed a diet with calcium carbonate. Calcium carbonate is the most common form of calcium used in calcium-fortified foods and supplements.

Weaver said the study, funded by the National Dairy Council, is the first direct comparison of bone properties between calcium from supplements and milk. It will be published in the August print issue of the *Journal of Bone and Mineral Research*.

"A lot of companies say, 'If you don't drink milk, then take our calcium pills or calcium-fortified food,'" Weaver said. "There's been no study designed properly to compare bone growth from supplements and milk or dairy to see if it has the same effect."

Data from Purdue's Camp Calcium, a research effort that studies how calcium and other nutrients affect bone growth, show that between the ages of 9 and 18 people require 1,300 milligrams of calcium a day for optimal bone growth. This is the equivalent of about 4 cups of milk or yogurt or the equivalent from cheese or other sources, Weaver said. After the age of 9, due mostly to peer pressure, the gap between the calcium youths need and actually get widens, she said.

The study involved 300 rats that were divided into two groups. For 10 weeks, the rats were given all the nutrients they require, but one group was given dairy and the other was given calcium carbonate as the source of calcium.

After 10 weeks, the bones of 50 rats from each group were measured for strength,

density, length and weight.

"We found those measurements were up to 8 percent higher for those who had milk over calcium carbonate," Weaver said.

The study also found a strong effect of having dairy as a calcium source followed by periods of inadequate calcium.

Over a second 10-week period, the remaining rats were fed as adults. Half of those were given adequate calcium as carbonate or milk. The other half were switched to half as much calcium as recommended, but were given calcium carbonate.

"This is comparable to humans who, during their early growth, drink a lot of milk to the age of 9 to 11, or maybe even adolescence, but then get only half as much milk calcium as they need after that," Weaver said. "Some take calcium supplements, but few adults get adequate calcium."

Weaver said the study showed the rats raised on dairy still had advantages over those who were given calcium carbonate even later when they were given half enough calcium as dairy or calcium carbonate.

"We found it was an advantage having milk or dairy while bones were growing over calcium carbonate, and it protects you later in life," Weaver said.

She is not sure why dairy is better, but said further study is needed.

"I think this will spark some people to want to figure out what it is about milk that gives it an advantage," she said.

"It's not due to increased calcium absorption. It's more about protecting against bones losing calcium, according to our results of calcium metabolism. Bones are in constant turnover, especially when they are growing. Youth need to have bone formation outweigh bone loss."

**From: Medical News Today April 30, 2009**

## **Nutritious New Low-sugar Juice Targeted For Diabetics, Individuals With High Blood Sugar**

*Scientists have created a diabetes-friendly, low-calorie vegetable juice out of pumpkins, pears, carrots and onions.*

Scientists in China are reporting development of a low-calorie, low-sugar vegetable juice custom-designed for millions of individuals with diabetes and pre-diabetic conditions that involve abnormally high blood sugar. They reported on the new drink at the 237th

National Meeting of the American Chemical Society in Salt Lake City, Utah on March 26.

Heqin Xing, Ph.D., and Xiuqi Liu of Jilin University in Changchun, China, described a cost-effective method of preparing a special type of vegetable drink using lactic acid-producing bacteria (LAB) to remove carbohydrates while retaining good taste, vitamins and other nutrients.

"This is an exciting development," Liu said. "The process significantly removes sugar but retains the nutritional content of the juice's raw materials." To develop the juice — made from pumpkin, balsam pear, onion and carrots — Xing and Liu turned to an age-old technique in the art of food production. For thousands of years, people have cultured food — including everyday eats such as yogurt, cheeses and sausage — by using the same LAB.

LAB microbes produce a compound commonly found in sour milk products called lactic acid. Because of LAB's healthy link to food production, this class of bacteria is also referred to as probiotics.

In the study, LAB reduced sugar content of the vegetable juice by transforming carbohydrates into lactic acid by a routine conversion process called fermentation. As this process increases the juice's acidity, it extends its shelf life as it inhibits growth of other bacteria. Compared to other microorganisms, LAB are known for their ability to withstand acidic environments. In addition to the lactic acid's protection against contamination, the acidity from fermentation could enhance flavors in the beverage.

Xing's and Liu's use of *Lactobacillus acidophilus* and *L. plantarum* in the vegetable juice increased its acidity by about 10-fold after 12 hours of fermentation. "The viable cell counts of *L. plantarum* in the fermented mixed vegetable juice still remained at up to 5 billion colony forming units per teaspoon after four weeks of cold storage," Xing said.

Traditional purification methods are more expensive and highly complex compared to the LAB process, Liu said. "This improves the preparation method of the diabetic-friendly vegetable drinks, but it also simplifies the method over existing ones."

And the taste of the low-sugar vegetable juice? Thanks to the addition of sugar, and a diabetic-friendly sugar substitute called xylitol, Xing said that the juice has a good mix of sweet and sour. "It has a good taste with reduced calories due to lower carbohydrates," said Xing. "I believe we can put it on the market possibly in one year after a few more tests."

**Science Daily (Apr. 5, 2009)**

