

PFNDAI Bulletin (September 2013)

**Protein Foods and Nutrition Development
Association of India**

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Editorial

Our ancestors did a lot of informal research to find a healthy diet and they devised foods with ingredients that would provide most of our daily requirements. This they did without the knowledge of nutrition and physiology but based on pure observation of various diets and ingredients therein and their effects. This took them centuries when they decided on the right variety avoiding the ones that were either difficult to digest or would cause adverse effects upon consumption. These food ingredients were developed locally so varied from region to region depending on their availability and local tastes and requirements.

Over the years not only there were scientific developments in the science of nutrition but in food processing. While one part was discovering why these ingredients or substances present in these ingredients were necessary for keeping healthy, other was trying to cope up with providing more food for growing urban population the food that was tasty and could be kept without spoilage. While vitamins were being discovered in fruits and vegetables, grains and oils etc. there were attempts to store the products without spoilage retaining the colour, flavour and appearance of the products using processes and additives.

Whole wheat would not give light fluffy bread so refining it to remove bran yielded better bread. Fresh fruits would spoil by the time they reach cities so they had to be canned or frozen or dried. They needed to be harvested while still unripe and harder so they could withstand heat treatment without softening too much. Freshly produced edible oils would not look and smell nice while they would also be prone to rancidity. So they were refined to remove free fatty acids as well as colour and odour to make them more palatable. Specialty ingredients were prepared that would make better breads, cakes and other delicacies that would be acceptable to various groups of people.

People in fact started demanding these properties.

Now the time has come there has been a rethink among consumers and manufacturers. Food is not just for enjoyment but also for health. Also although health is important consumers would not accept healthy

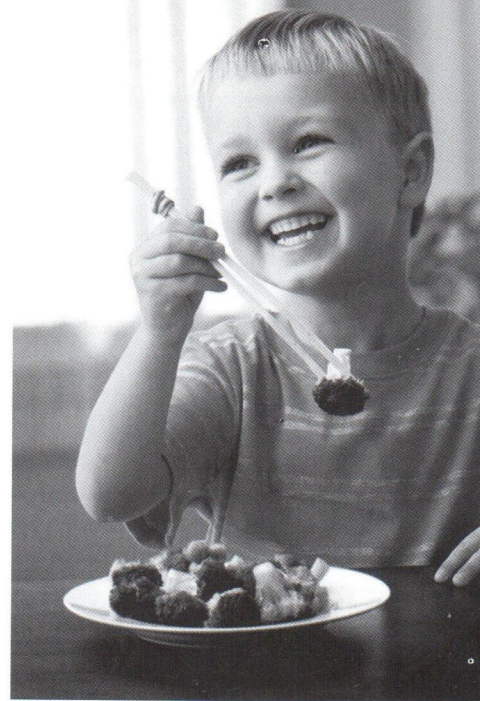
food without taste and flavour. When choosing foods, consumers are looking at nutrition while deciding the food choices. They prefer healthy oils, whole grain products and wholesome fruit and vegetable products if not whole fruits and vegetables.

Still it is a challenge for both. Manufacturers have to sell the products which they will only if taste is right. Fortunately there have been developments in ingredients and processes that allow healthy but difficult ingredients to make tasty products. One example is rice bran oil. Formerly chemical refining used would remove the oryzanol which is heart friendly. Development of physical refining makes rice bran oil containing oryzanol with just slight colour acceptable in normal cooking. Developments in dough mixing technology with better mixers allow whole wheat dough leavening producing softer bread.

Researchers and developers in future will have to keep in mind nutrition and health along with taste and flavour of the food products as more and more people are aware of good nutrition and its effect on health.

With season's greetings,

Prof. Jagadish S. Pai,
Executive Director
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Maize: The Corn of Plenty

by Prof. Jagadish Pai

Maize or corn is another major staple cereal. Although ancient cultures in American continents consumed it in different varieties cooked, ground or prepared various products, its spread in Europe and other continents occurred only in 15th and 16th centuries when explorers and traders brought it. It spread in the rest of the world because of its ability to grow in diverse climates. Sugar-rich varieties, sweet corn are usually grown for human consumption while others are used for animal feed and as chemical feedstocks.

Table: Corn Production in 2012 FAOSTATS	
Country	Production in Tonnes
United States of America	273832130
China	208130000
Brazil	71296478
Argentina	25700000
Mexico	22069254
India	21060000
Ukraine	20961300
Indonesia	19377030
France	15614100
South Africa	12500000

Since several years now corn is leading the cereal grain production with world production of corn for 2012 being over 875 million tonnes followed by rice at 718 million tonnes and wheat at 674 million tonnes. The table gives some of the leading corn producing countries with the US accounting for over 40% of world production and India being at number six.

American corn was mostly used for corn ethanol, about 40% of the crop. Also the genetically modified corn made up about 85% of corn planted in the US. Different varieties of corn are being used for sweet corn, corn on the cob, baby corn, pop corn and corn flakes. There are many products that are made from corn in Mexico where it is central to Mexican cuisine, including tortillas, tamales, tacos, enchiladas, tastadas and many more. In Punjab, corn roti is quite popular.

Corn is a major source of starch. Corn starch is used both at home and in many industries for food and other applications. Starch may be hydrolysed to produce syrup which is used to produce, dextrose, glucose, corn syrup solids, high-fructose corn syrup (HFCS) and also for preparing grain alcohol. There are also many non-food applications of starch for making plastics, fabrics,

adhesives and other chemical products.

Table: Nutrition Value: Sweet corn, Yellow, Raw	
Nutrient	Per 100g seeds (%DV)
Energy	360 kj (86 kcal)
Carbohydrates	18.7g
Starch	5.7g
Sugars	6.26g
Dietary fibre	2g
Fat	1.35g
Protein	3.27g
Water	75.96g
Vit A equiv.	9µg (1%)
Lutein & Zeaxanthin	644 µg

Thiamine (B1)	0.155mg (13%)
Riboflavin (B2)	0.055mg (5%)
Niacin (B3)	1.77mg (12%)
Pantothenic acid (B5)	0.717mg (14%)
Vit B6	0.093mg (7%)
Folate (B9)	42 µg (11%)
Vit C	6.8mg (8%)
Iron	0.52mg (4%)
Magnesium	0.163mg (8%)
Phosphorus	89mg (13%)
Potassium	270mg (6%)
Zinc	0.46mg (5%)

From: USDA Nutrient Database

The tender sweet corn is a nutritious food. As can be seen from the table, it contains good proportions of various vitamins, minerals and other macro and micro-nutrients. When the corn is dried some of the vitamins are lost but still the corn is a good source of many minerals including zinc, magnesium, potassium and iron. It has protein content only next to wheat and sorghum but as cereal proteins go, it lacks lysine and tryptophan but when combined with pulses can be compensated to some extent. Corn is also a high quality nutritious corn oil, which is rich in polyunsaturated fatty acids. The comparative macro-nutrients in major cereals are given in the table.

Table: Comparison of Macro-nutrients of Major Cereals			
Nutrient per 100g	Maize/corn	Rice	Wheat
Water g	10	12	13
Energy kJ	1528	1528	1369
Protein g	9.4	7.1	12.6
Fat g	4.74	0.66	1.54
Carbo-hydrates g	74	80	71
Fibre g	7.3	1.3	12.2

From: USDA Nutrient Database

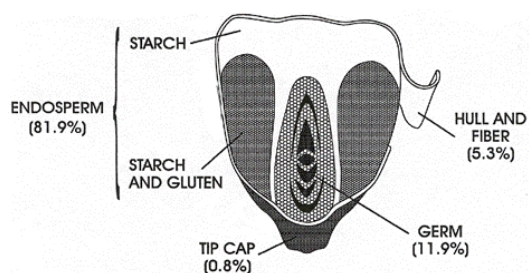
Corn Refining Process

Corn refiners have been perfecting process of separating corn into its component parts to create a large number of value added speciality products. The corn wet milling process separates corn into four basic components: starch, germ, fibre and protein.



There are five basic steps in this process. First corn is inspected and cleaned. About 70% of corn kernel is starch (from endosperm), about 10% is protein, mostly gluten, 4% is oil, extracted from germ

and 2% is fibre present in hull. Corn refining process separates each component and further refines into specific products. Upon arrival of shipment, corn is inspected and cleaned to remove pieces of cob, dust, chaff and foreign materials and stored in silos until ready for steeping.



Corn is steeped in stainless steel tanks for about 30 to 40 hours by soaking in water at 50°C. During steeping, kernels absorb water increasing their water content to about 45% while more than doubling their size. Sulphur dioxide (0.1%) is added to water to prevent bacterial growth during steeping. Corn swells and softens; the mild acidity loosens the gluten bonds within corn and release the starch. After steeping, corn is coarsely ground to break the germ loose from other components. Steepwater is recovered for nutrients in it for use

in animal feeds. The ground corn in slurry is sent to germ separators.

Cyclone separators spin the low density corn germ out of the slurry. The germs contain 85% oil and are pumped onto screens and washed to remove any starch. Combined mechanical and solvent process extracts oil from germ. Oil is then refined and germ residue is saved for animal feeds.

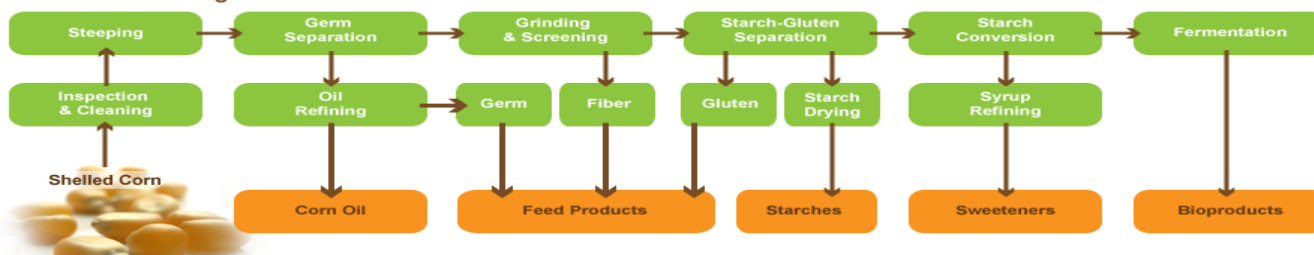
Corn and water slurry from germ separator is ground more thoroughly in impact or attrition-impact mill to release starch and gluten from the fibre in the kernel. Suspension of starch, gluten and fibre flows over screens, which catch fibre but allow starch and gluten to pass through. Collected fibre is slurried and screened to remove residual starch or protein, then stored for animal feed. Starch and gluten suspension goes to starch separators.

Gluten has lower density compared to starch. Passing through a centrifuge, the gluten is readily spun out for use in animal feeds. Starch with small amounts of protein is diluted, washed several times and washed in hydroclones to remove last traces of protein and produce high quality starch with 99.5% purity. Starch may be dried and marketed as corn starch or modified into speciality starches, converted into corn syrups, maltodextrin, glucose or dextrose.

Starch is liquefied in presence of acid and/or enzymes which convert starch to low-glucose solution or maltodextrin. Treatment with another enzyme continues the conversion process. The acid or enzyme process could be stopped at any point to produce right mixture of sugars like glucose and maltose for syrups of different applications with different amounts of glucose and sweetness. The syrup is then refined in filters, centrifuges, and ion-exchange columns, and concentrated. Syrups may be sold as such or crystallised into solids or further processed to prepare high-fructose corn syrup.

Starch or syrup may also be used for fermentation processes for preparing a large number of chemicals. The overall Corn Refining process is given below in the figure.

The Corn Refining Process



Food Products from Corn

Corn Flakes: These are one the popular breakfast foods originally manufactured by Dr. Kellogg using corn over 100 years ago by toasting rolled corn serving to his patients. Although technology has made many changes in the way corn flakes are now made but basic process is similar. Corn grits are prepared from corn kernel, which are milled to get flake size grits which are dried and transported to corn flake processing units and kept in silos. Grits are funnelled into stainless steel cookers. Flavour formula using malt, sugar and salt is then added to them and cooked under pressure. Cooked grits are exposed to hot air to reduce moisture. Grits are then collected and tempered to equilibrate moisture throughout each piece of grits. The grits are then pressed using heavy flaking rollers into flakes. Flakes are then tumble roasted in rotary ovens at high temperatures to golden colour with good flavour and crispness. Vitamins are then added to flakes.



Corn flakes are not only very popular common breakfast food but a popular ingredient in many Indian recipes including corn flake chivda.

Cornmeal is coarse ground flour or meal from dried maize. It can be fine, medium or coarse in consistency but not as fine as wheat flour. Roti is made from cornmeal in North India. Cornmeal is mixed with whole-wheat flour, some salt and warm water to make into dough after kneading. After shaping into balls which are flattened and rolled to medium thickness, flat bread dough is heated in a pan till cooked to golden brown.



Masa is prepared from whole corn by alkaline treatment. Mature hard dried grain is soaked and cooked in dilute slaked lime (calcium hydroxide) by process of nixtamalization. Alkali helps dissolves hemicellulose component of cell walls



loosening hulls from kernels and softens corn. Some corn oil is broken into mono and diglycerides which are emulsifiers. It also helps keeping protein together with polysaccharides. While cornmeal by itself is unable to form good dough without adding wheat flour, chemical changes in masa allows it to dough formation which can be easily rolled into tortillas. After this treatment, it is ground and dried into masa flour which is popular in South America.



When people go to movies they love to eat popcorns. These need special type of corn, popping corn that expands from the kernel and puffs when heated. Popping corn is able to pop like amaranth, sorghum and millet, because it has hard moisture-sealed hull and dense starchy interior. As it is heated, pressure builds inside the kernel until it explodes when hull ruptures and sudden release puffs the starchy interior.



Corn Oil processing starts with corn germ, the embryo which is distinct from endosperm that contains starchy nutrients. Germ contains 85% of total oil present in the seed. The corn kernels are first dehulled and then crushed with a grooved roller to break down cell walls. This is then wet milled, steeped in water containing SO₂ to separated components of the seed. The germ that is collected is passed through heated screw press expeller to yield about half the oil present in germ. Remaining oil can be recovered by solvent extraction with hexane. The two oils may be combined with residual cake used as animal feed. Crude oil is filtered and degummed using steam

which wets lecithin and other gums making them heavier so as to be removed by centrifugation. Alkali refining uses sodium hydroxide solution that absorbs gums and neutralises free fatty acids which may be removed by hot water. Colour from corn oil may be removed by bleaching that uses activated clay that removes colour pigments, residual soap from alkali treatment and metal ions. Filtration removes clay from oil. Further processing with steam deodorises the oil yielding refined corn oil with light colour, almost no colour and good stability.

Health Benefits of Corn

Prebiotic Potential of Whole Maize Cereals: Researchers at Reading University carried out double-blind, placebo controlled human feeding study on healthy adults. Fecal bifidobacteria levels increased significantly with whole grain corn. Thus corn can cause an increase in beneficial gut bacteria.

Anti-diabetes and Anti-hypertension Potential of Corn: Scientist in Brazil studied ten traditional foods native to Peruvian Andes for healthy components thought to contain early stages of diabetes and high blood pressure. Purple corn scored highest in free-radical scavenging antioxidant effect. It also showed highest total phenolic content and alpha-glucosidase inhibitory activity.

Cornbread as Whole Grain Source: University of Massachusetts Medical School tested acceptability of whole grain and legume products among children and youth at a diabetic camp. Whole grain cornbread was the favourite (85%) followed by whole wheat bread.

Carotenoids in Corn Food Products: Carotenoids act as antioxidants and are especially associated with eye health. Scientists at Purdue University studied yellow corn for the bioavailability of carotenoids. Lutein and zeaxanthin were the major carotenoids and their contents varied in different products like breads, corn puffs, porridge etc. along with carotenes. However, all products provide the health benefits from different carotenoids irrespective of other carotenoids present.

Other Benefits: Besides carotenoids, there are many other antioxidants present in corn including vitamin C, anthocyanins, coumaric acid, ferulic acid, syringic, vanillic and protocatechuic acids. Different varieties have different antioxidants combination. These are beneficial in heart conditions as well as reduce the risk of various cancers. Fibre from corn is not only useful for gut bacteria but also for control of blood sugar and controls cholesterol. It prevents constipation. With many other vitamins like B vitamins the tender sweet corn is a healthy food.

Nutrition Week Activity 2013 in Mumbai: Report

by Ms. Ummeayman R., Nutritionist, PFNDAI

PFNDAI celebrates the Nutrition Week Activity every year and encourages students towards a Healthy Lifestyle. It also provides a platform for the industry academia interaction and the students are exposed to the requirements of industry, this gives them an encouragement to prepare themselves for the task to be undertaken when they are in the field. The Association has been celebrating the Nutrition Week Activity in various colleges of Food Science and Nutrition, this year it was celebrated on 7th September 2013 at ICT –Institute of Chemical Technology, Matunga, Mumbai. Now a days, youth are engaged in many physical activities and sports, thus we thought it apt to organize this year's nutrition week activity with the theme of 'Sports Nutrition'.

Morning session had various competitions for students from Undergraduate and Post Graduate in Food Science and Nutrition. Poster competition was conducted on the theme 'Food Safety in Preparing Foods' and Recipe Completions was conducted, wherein the students had prepared 'Iron Enriched Lunch Recipes'. Quiz completion was conducted for the students, with questions based on Food Science, Marketing, Management, Food technology and Nutrition. The recipes and posters were judged by Mr. Purnachand, Dr. Jyoti Baliga, Dr. Shalini Arya and Dr. Chanda Gokhale, all the distinguished judges being well known experts in the field of Food Science, Dietetics and Nutrition. The competitions session was followed by Seminar session post lunch, a brief of the presentations is as follows.

Dr. Pai, Executive Director, PFNDAI in his welcome remarks stated that NWA tries to bring academia and industry together. Today it is very important to have such interactions as many colleges are lacking this. It is important to have such platforms as it gives commercial perspective to the students and makes them aware of how the industry thinks. When a student designs a product, he should understand that it is not only about how good a product tastes but how economical it is, as there cannot be a product which is not economical / affordable to buy.

The topic was 'Sports Nutrition' as sports have become very important today. We have been complacent about our wellbeing for decades but now we realize how important it is to be active and we have also realized that Indians are at a greater risk of heart diseases. People used to live 50/55 years average age but today the average age is beyond 60 years and this has also made us realize that we need to be concerned of Alzheimer's, Parkinson diseases etc. Although there are problems but there are solutions also available today and many youngsters are well aware and concerned, thus, want to join sports activities and go to gyms, use treadmills. All this requires special nutrition which we are focusing in this seminar.

Role of Soy in Sports and Performance Nutrition was presented by Mr. U Purnachand, DuPont Nutrition & Health (Solae). In India 30% are overweight and 10% are obese. Why are we so concerned about this? It is because they contribute to lifestyle diseases and non-communicable diseases. Percentage of obese population is on rise and is posing a risk to the increase of CVD (cardiovascular disease). We are much concerned as we do not have facilities to manage this and so it will increase the burden on government. Self-initiative with food and beverage is the current option available or surgeries will be the future options to tackle obesity.

One question that comes every time sports nutrition is talked about is, who are the target for sports nutrition? Today health club memberships are increasing globally, weight management is a concern, then what the consumer is looking for, is he trying to lose weight, maintain or gain weight. Over the past 5 years, there has been a

convergence of the weight management and sports nutrition markets creating a consumer category that is referred to as Active Nutrition. The Active Nutrition category, as we define it, captures consumers from the weight management and sports nutrition segment sharing a common desire to live a healthy lifestyle, which includes exercise. Surveys have shown that India consumers want to maintain weight, minimize weight gain as they age, remain strong and stress free as they age.

Although some of these individuals want to lose weight, many are interested in preventing weight gain and maintaining or adding some lean muscle. They may consume traditional meal replacement slimming products or sports nutrition products. In many parts of the world, sports nutrition products are growing faster than meal replacement slimming products. India, however, is still seeing robust growth in meal replacement slimming products and this growth is expected to continue over the next 5 years. What is apparent is that globally, more and more consumers of meal replacement bars and beverages are starting to exercise while consumers of sports nutrition products are focused on weight management.

'Power of Breakfast' by Ms. Madhavi Trivedi, Kellogg's gave students an understanding of the importance of breakfast not just for general consumers but for athletes and sportsmen. Breakfast is refuelling and it improves the mental health as well as decreases the chances of inappropriate snacking. It is a myth that the nutrient deficiency created by the skipping of breakfast could be made up during the day.

In sports, breakfast has a special importance as most of athletic trainings happen in morning. The nutrition guidelines for sports states that energy and macronutrients are important for athletes especially carbohydrates and proteins and this along with iron, calcium, potassium, and fibre is available in cereal based breakfast. Better voluntary endurance has been observed in breakfast eaters. Breakfast rules in position mode towards intense activity and skipping breakfast have reduced intakes of nutrients and vitamins and so decreases their performance, especially intellectual performance.

Mr. Anek Arora, Roquette India, presented on 'Newer Ingredients in Sports & Weight Management'. Sports nutrition was a category that focused only on rehydration, recovery drink, energy drinks, however, now it looks at a larger wellbeing. The category of Sports nutrition includes bars, gels, shakes that enhance training and exercise and enhance weight loss & toning. Top products claim about strength & performance, fitness, recovery, weight management etc.

Protein and Carbohydrates are two macro nutrients that are a Necessity for Sports as they compensate for increased protein/amino acid oxidation during exercise and provide substrate for lean tissue build-up or for the repair of muscle damage induced by exercise. 3:1 Carbohydrate: Protein ratio helps to promote recovery and replenishment of muscle glycogen. Moderate protein and reduced carbohydrate diets improve body composition and as a result, the fat mass loss is more effective during initial weight loss and long-term weight maintenance.

'Fuelling Sporting Excellence' was presented by the students of ICT college- Ms. Pooja Sharma, Ankita Mangalvedhe, Anmol Chandhok (guidance by Dr. Vilas Shirhatti). In their presentation they highlighted the fact that in today's sports, importance is not only for sportsman's skill but the power to push to his uttermost limits is also considered. Basic health to optimum fitness is the prerequisite for sportsman, and then comes the professional sportsmen, who need more power and special fitness levels. There are diet plans for athletes, but it is more for muscle recovery and repair, however, there is no diet which is specific for an athlete but it is influenced by their training, age, gender etc. An athlete in his growing stage would need more of calcium and diet to maintain his bone health and a female athlete would require more of iron, whereas male athlete would be concerned more of calories.

While planning a diet, it is important to consider the activity that is involved i.e. sitting, running around, throwing, lifting an object etc.

In concluding remarks by Mr. Shenoy, said that Nutrition is wellbeing of health and mind. Much of industry is focusing on physical health but we also need to move towards health for mind and Scientists and Technologist need to consider this and also look at health for all as sports nutrition is not only for a specific section of professionals but it is for the masses and today's consumer wants to follow its favourite sportsman in all aspects.

Such informative blend of knowledge supply was very much appreciated by all and this was possible by the support of companies such as Kellogg's, DSM Nutritional Products, Roquette India and DuPont Nutrition & Health.

RESEARCH IN HEALTH & NUTRITION

GRAPE CONSUMPTION LINKED TO HEALTHIER DIETS

August 6, 2013 **Food Product Design**

Snacking on grapes and raisins or drinking 100% grape juice is associated with healthier eating patterns and improved nutrient intakes, according to new research published in the ***Journal of Food Science***.

Supported by the National Grape and Wine Initiative (NGWI), the study's researchers observed grape consumption in non-alcoholic forms most commonly consumed by U.S. adults and children. After analyzing the diets of more than 21,800 children and adults, as well as using data from the 2003-2008 National Health and Nutrition Examination Survey (NHANES), researchers found grape product consumers had increased intakes of total fruit and several important nutrients, such as vitamin A, vitamin C, vitamin B6, dietary fibre, calcium, magnesium and potassium.

In addition, adult grape product consumers had increased intakes of vegetables, whole grains, nuts and seeds, along with lower intakes of added sugars, total fat, saturated fat and cholesterol.

"It is interesting to note that not only did grape consumers have increased intakes of healthy foods and critical vitamins and minerals, but grape consumers also ate less unhealthy foods, specifically solid fat and added sugars," said lead author Carla McGill, Ph.D.

This new study complements an extensive body of research supporting the role grapes, raisins and 100% grape juice can play in a healthy lifestyle. Previous research shows eating grapes can help reduce inflammation and fat storage, and it also improves antioxidant defence to protect against organ damage associated with metabolic syndrome.

"[The research] reinforces the association between grapes and a healthier diet, which is good news for consumers," said Jean-Mari Peltier, executive director of NGWI. "Grapes, raisins and 100% grape juice are all foods that people enjoy eating, and this information adds another dimension to the grape and health story."



Scientists learn how soy foods protect against colon cancer

University of Illinois scientists have evidence that lifelong exposure to genistein, a bioactive component in soy foods, protects against colon cancer by repressing a signal that leads to accelerated growth of cells, polyps, and eventually malignant tumours.

"In our study, we report a change in the expression of three genes that control an important signalling pathway," said Hong Chen, a U of I professor of food science and human nutrition.

The cells in the lining of the human gut turn over and are completely replaced weekly, she noted. "However, in 90% of colon cancer patients, an important growth-promoting signal is always on, leading to uncontrolled growth and malignancies. Our study suggests that the aberrant Wnt signalling during the development of colon cancer can be regulated by soy-rich diets."

"The good news is that a diet rich in soy genistein represses those signals through epigenetic modifications at the regulatory regions of those genes," said Yukun Zhang, a doctoral student in Chen's laboratory.

Chronic exposure to genistein, a soy isoflavone, reduced the number of pre-cancerous lesions in the colons of laboratory rats exposed to a carcinogen by 40% and reduced Wnt signaling to normal levels, she said.

In their study, the scientists modelled lifetime exposure to soy by feeding pregnant rats and their offspring a diet containing soy protein isolate and a diet that contained genistein compound. At seven weeks of age, offspring rats were exposed to a carcinogen, and they continued eating either the soy protein or the genistein diet until they were 13 weeks old.

At that time, the researchers inspected the colons of rats in both soy groups and compared them to rats in a control group, noting the number and severity of tiny abnormal growths in each. They also compared Wnt signaling before and after the carcinogen to see whether either diet had any effect on its upregulation.

In the genistein-fed animals, signalling levels were similar to rats that had not received the carcinogen.

"Genistein decreased the expression of three genes and repressed this signalling process that is associated with abnormal cell growth and cancer development," Chen said.

She said this shows that colon cancer is an epigenetic disease, meaning that dietary and environmental factors can influence genes to be switched on or off so you have a different pattern of gene expression, leading to a change in disease susceptibility.

It has long been known that immigrants from Asia—where soy is traditionally a food staple—experience rising levels of colon cancer as they adopt the eating habits of the Western nations they now call home, she said.

"The genetic information you inherit from your parents is not the whole story. Our dietary choices, our exposure to environmental toxins, even our stress levels, affect the expression of those genes," she said.

IFT Weekly Aug 7, 2013



Eating Fish Lowers Risk of Rheumatoid Arthritis

August 13, 2013 Food Product Design

SOLNA, Sweden—Eating one portion of fatty fish, or four portions of lean fish, every week may reduce the risk of developing rheumatoid arthritis, according to a study published in the journal *Annals of the Rheumatic Disease*.

In the study, researchers from the Karolinska Institute in Sweden sent a questionnaire to all women between 1987 and 1990 who participated in The Swedish Mammography Cohort Study and who were born between 1914 and 1948. The questionnaire called for information on their diet, height, weight, parity and education level. Then in 1997, a follow-up questionnaire was sent to 56,030 women requesting the same information in addition to information on smoking history, physical activity and use of dietary supplements and aspirin. The woman also completed a food frequency questionnaire regarding how often they ate a selection of 67 foods in 1987, and 96 foods in 1997. The selection included a variety of lean and fatty fish.

Of these women, 32,000 had their health monitored between 2003 and 2010 and results showed 205 were diagnosed with rheumatoid arthritis. The results showed that across the study group, the women with the highest consumption of omega-3 polyunsaturated fatty acids (PUFAs) had four times high intake than those with the lowest intake. Further, of the women who developed arthritis, 27% had a dietary omega-PUFAs intake of less than .21 grams per day. The women in the study who consumed over .21 grams per day, which is equivalent to a minimum of one serving of fatty fish, or four servings of lean fish, in both 1987 and 1997 had a 52% lower risk of developing rheumatoid arthritis. Additionally, findings showed that eating more than one serving of all types of fish every week for a minimum of 10 years was linked to a 29% reduced risk of arthritis, compared to eating less than one portion a week. These results coincide with guidelines from the American Dietary Guidelines Advisory Committee, which suggests that consuming seafood twice per week to obtain an average daily intake of 250 mg of omega-3 fatty acids in the diet. Other studies have shown that women who consume an increased number of omega-3 fatty acids found naturally in fish like salmon and tuna are less likely to develop breast cancer as well.

Rheumatoid arthritis mainly affects the fingers, arms, legs and wrists. Around 50 million adults in the United States suffer from some form of arthritis and it's estimated that by 2030, 67 million Americans will have the disease.



FLAVONOIDS MAY KILL PANCREATIC CANCER CELLS

August 16, 2013 **Food Product Design**

URBANA, Ill.—New research out of the University of Illinois suggests apigenin and luteolin— flavonoids found naturally in foods like celery, artichokes and herbs, especially Mexican oregano—kill human pancreatic cancer cells in the lab by inhibiting an important enzyme.

"Apigenin alone induced cell death in two aggressive human pancreatic cancer cell lines. But we received the best results when we pre-treated cancer cells with apigenin for 24 hours, then applied the chemotherapeutic drug gemcitabine for 36 hours," the researchers said, adding the trick seemed to be using the flavonoids as a pre-treatment instead of applying them and the chemotherapeutic drug simultaneously.

Pancreatic cancer is the fourth-leading cause of cancer-related deaths, with a 5-year survival rate of only 6%. Ultimately the goal is to develop a cure, but prolonging the lives of patients would be a significant development.

"Even though the topic is still controversial, our study indicated that taking antioxidant supplements on the same day as chemotherapeutic drugs may negate the effect of those drugs," the researchers said. "That happens because flavonoids can act as antioxidants. One of the ways that chemotherapeutic drugs kill cells is based on their pro-oxidant activity, meaning that flavonoids and chemotherapeutic drugs may compete with each other when they're introduced at the same time."

The scientists found apigenin inhibited an enzyme called glycogen synthase kinase-3 (GSK-3), which led to a decrease in the production of anti-apoptotic genes in the pancreatic cancer cells. Apoptosis means that the cancer cell self-destructs because its DNA has been damaged. In one of the cancer cell lines, the percentage

of cells undergoing apoptosis went from 8.4% in cells that had not been treated with the flavonoid to 43.8% in cells that had been treated with a 50-micromolar dose. In this case, no chemotherapy drug had been added. Treatment with the flavonoid also modified gene expression.

The study is the first to show that apigenin treatment can lead to an increase in interleukin 17s in pancreatic cells, showing its potential relevance in anti-pancreatic cancer activity.

Pancreatic cancer patients would probably not be able to eat enough flavonoid-rich foods to raise blood plasma levels of the flavonoid to an effective level. But scientists could design drugs that would achieve those concentrations.

"If you eat a lot of fruits and vegetables throughout your life, you'll have chronic exposure to these bioactive flavonoids, which would certainly help to reduce the risk of cancer," they said.



PROBIOTICS MAY PROTECT INFANTS FROM ALLERGIES

August 19, 2013 **Food Product Design**

MIAMI—A new meta-analysis published in the journal *Pediatrics* suggest prenatal and postnatal administration of probiotics may reduce immunoglobulin E (IgE) levels in infants and protect against sensitization to hereditary allergies but may not protect against asthma or wheezing.

Researchers at the University of Miami conducted a meta-analysis of randomized, placebo-controlled trials to assess the effects of probiotic supplementation on atopic sensitization and asthma/wheeze prevention in children.

Probiotics were effective in reducing total immunoglobulin E (IgE) (mean reduction: -7.59 U/mL [95% confidence interval (CI): -14.96 to -0.22]; $P = .044$). Meta-regression showed that the reduction in IgE was more pronounced with longer follow-up. Probiotics significantly reduced the risk of atopic sensitization when administered prenatally (relative risk: 0.88 [95% CI: 0.78 to 0.99]; $P = .035$ for positive result on the skin prick test and/or elevated specific IgE to common allergens) and postnatally (relative risk: 0.86 [95% CI: 0.75 to 0.98]; $P = .027$ for positive result on skin prick test). Administration of *Lactobacillus acidophilus*, compared with other strains, was associated with an increased risk of atopic sensitization ($P = .002$). Probiotics did not significantly reduce asthma/wheeze (relative risk: 0.96 [95% CI: 0.85 to 1.07]).

Prenatal and/or early-life probiotic administration reduces the risk of atopic sensitization and decreases the total IgE level in children but may not reduce the risk of asthma/wheeze. Follow-up duration and strain significantly modified these effects. Future trials for asthma prevention should carefully select probiotic strain and consider longer follow-up.



CORIANDER IMPROVES HEALTH BENEFITS OF FISH

August 15, 2013 **Food Product Design**

OTTAWA—Spicing up fish may improve the fillet's fatty acid composition to increase its health benefits, according to new research published in the *Canadian Journal of Animal Science*. Researchers found coriander-fed fish had increased concentrations of EPA and DHA within the whole fillet.

University of Saskatchewan researchers studied new methods for improving the fatty acid composition of farmed fish, including strategies to increase long-chain polyunsaturated fatty acids in rainbow trout. Specifically, they looked at the addition of coriander oil to vegetable oil-based diets to increase the bioconversion of alpha-linolenic acid to EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid).

Their research showed fish that were fed with coriander had increased concentrations of EPA and DHA, and researchers found no negative effects on the health or growth of the fish.

The health benefits of consuming omega-3 fatty acids are well-established. Research shows omega-3s can **improve eye health, lower cancer risk** and even **lower mortality risk**. The primary sources of these fatty acids in the human diet are through fish and seafood, and as wild fish stocks decline, the aquaculture industry has become one of the fastest growing animal production sectors. This growth has increased demand for aquaculture feed production, which has caused further demand for fish oil.

Historically, fish are fed fish oil to increase levels of EPA and DHA. However, the fish oil supply is static—cost has increased and the industry is seeking low cost alternatives, such as vegetable oils.

"Our study shows that the addition of coriander oil to vegetable oil diets has the potential to improve the fillet fatty acid composition of farmed fish," said Murray Drew, professor at the University of Saskatchewan's College of Agriculture and Bioresources and co-author of the study. "This discovery will contribute to the overall sustainability of aquaculture."



Ginkgo biloba may boost brain functions by increasing stem cell growth: Rat study

By Nathan Gray, 26-Jul-2013 Nutra Ingredients USA

Supplementation with an extract from Ginkgo biloba may help to battle memory loss and cognitive impairments associated with dementia by encouraging the growth and development of neural stem cells, according new research in rats.

The study, published in *Neural Regeneration Research*, investigated the effects of Ginkgo biloba extract on the formation of neurones in rat brains after previous findings suggested that the Ginkgo biloba extract EGb 76 - *which containing high levels of flavonoids and terpenoids* - improves memory loss and cognitive impairments in patients with senile dementia. Led by Jiwei Wang of Weifang Medical University, China, the research team used a rat model of vascular dementia to test the effects behavioural and physiological effects of supplementation with the extract - finding that rats given the EGb761 extract performed significantly better in tests of learning and memory and had significant growth of neural stem cells in certain brain regions.

"These experimental findings suggest that EGb761 enhances proliferation of neural stem cells in the subventricular zone and dentate gyrus, and significantly improves learning and memory in rats with vascular dementia," wrote Wang and his colleagues.

"EGb761 administration can regulate neural stem cell proliferation, migration and differentiation, and promotes cell proliferation and differentiation in rats with vascular dementia," they added.

The team reported that the extract promoted growth in both brain regions for up to four months - with peak growth occurring around one month after the model of vascular dementia was induced and supplementation had begun.

"This evidence suggests that there is an optimal phase (time-window) for promoting the proliferation of neural stem cells."

Study details

Wang and his team created the rat model of vascular dementia by repeatedly clipping and reperfusion of the bilateral common carotid arteries of rats in combination with an intraperitoneal injection of a sodium nitroprusside solution. Seven days after establishing the model, rats were then supplemented with EGb761 at 50 mg/kg per day. The rats' learning and memory abilities were assessed during the trial using the Morris water maze, while proliferation of endogenous neural stem cells in the subventricular zone and dentate gyrus were labelled by 5-bromo-2-deoxyuridine immunofluorescence in all rats at 15 days, and 1, 2, and 4 months after model establishment.

EGb761 was found to significantly improve learning and memory in the rats, while immunofluorescence analysis showed that the number and proliferation of 5-bromo-2-deoxyuridine-positive cells in the subventricular zone and dentate gyrus of the was significantly higher for rats given the extract - meaning that the Ginkgo biloba led to a proliferation of neuronal stem cells in these areas.

The team said that their findings provide a new idea and approach to further explore the induced proliferation of neural stem cells in situ in the treatment of vascular dementia.



FISH OIL MAY REVERSE LIVER DISEASE IN CHILDREN

August 15, 2013 **Food Product Design**

Los Angeles—A six-month treatment of fish oil can help reverse liver disease in children with intestinal failure, according to new research published in the *Journal of Parenteral and Enteral Nutrition*.

While previous studies show replacing soybean oil with fish oil can reverse liver disease, researchers from UCLA discovered the necessary duration of fish oil treatment had not been established. The recent clinical trial shows 24 weeks of fish oil treatment can replace soybean oil, and even decrease the need for liver and intestinal transplants associated with the disease.

Because children who suffer from intestinal failure cannot consume food orally, a nutritional cocktail of sugar, protein and fat made from soybean oil is injected through a small tube in their veins. However, the soybean oil has been associated with a potentially lethal complication known as intestinal failure–associated liver disease, which may require a liver or intestinal transplant. Such a transplant can prevent death, but the five-year post-transplant survival rate is only 50% to 70%.

"With this particular study, we set out to determine if a finite period of six months of intravenous fish oil could safely reverse liver damage in these children, and we have had some promising results," said lead author Kara Calkins, an assistant professor in the department of pediatrics, division of neonatology and developmental biology, UCLA. "But because intravenous fish oil is not yet approved by the Food and Drug Administration (FDA) and is much more costly than soybean oil, it is typically not covered by insurance."

Calkins added that fish oil is considered experimental at this point, and it is currently available only under special protocols.

In the study, intravenous soybean oil was replaced with intravenous fish oil in ten patients between the ages of 2 weeks and 18 years who had advanced intestinal failure–associated liver disease, and who were at high risk for death and/or transplant. The researchers compared these subjects with 20 historical controls who had received soybean oil.

Results showed the children receiving fish oil had a much higher rate of reversal of liver disease than those who received the standard soybean oil. After 17 weeks of fish oil, nearly 80% of patients experienced a reversal of their liver disease, while only 5% of the soybean patients saw a reversal.

"We are also trying to better understand how fish oil reverses this disease by investigating changes in proteins and genes in the blood and liver," Calkins said. "These studies will provide the scientific and medical community with a better understanding of this disease, and how intravenous fish oil works."

Recent studies indicate several more reasons to include fish in the diet. Omega-3 fatty acids found in fish such as salmon, tuna and sardines can lower a woman's breast cancer risk, while eating one portion of fatty fish every week can also reduce the risk of developing rheumatoid arthritis.



Do glucosamine and chondroitin really help arthritis pain?

Some people swear that over-the-counter dietary supplements called glucosamine and chondroitin ease arthritis pain, reduce stiffness, and protect joints from further damage. Others say they don't help.

A major study of glucosamine and chondroitin published in *The New England Journal of Medicine* concluded that how much relief a person gets depends on how severe his or her arthritis pain is to begin with. Among 1,500 participants with knee osteoarthritis, glucosamine and chondroitin taken alone or together provided no more relief than placebo. Those with mild pain did not see much benefit. People with more severe pain experienced modest relief with the combination of glucosamine and chondroitin.

If you're wondering whether glucosamine and chondroitin might work for you, the answer is "it depends." If your osteoarthritis pain is moderate or significant, try taking both glucosamine and chondroitin for two to three months. If you find they ease your pain, it's reasonable to keep using them. If not, save your money. As always, if you choose to try these or any other vitamins, supplements, or alternative therapies, tell your doctor.

Harvard Medical School Health Beat July 20, 2013



Proper Diet Decreases Prostate Cancer Risk

July 2, 2013 Food Product Design

LOS ANGELES—Proper nutrition and lifestyle changes can decrease the risk of highly aggressive prostate cancer, according to a new study published in the journal *Nutrition and Cancer*. Recommendations from researchers include consuming low-calorie foods, eating fruits and non-starchy vegetables and limiting weekly intake of red meat.

The study investigated the eight World Cancer Research Fund (WCRF) lifestyle recommendations for preventing aggressive prostate cancer. Along with advising low-calorie food consumption, increased fruit and vegetable intake and limited red meat, these recommendations provided desirable ranges of body mass index (BMI), physical activity, salt intake, and legumes and unrefined grain consumption.

Previous studies show **men who eat lycopene-rich tomatoes and tomato products may reduce their risk for prostate cancer**, and **replacing calories from carbohydrates with healthy vegetable fats**, such as olive and canola oils, nuts, seeds and avocado, is associated with a 29% lower risk of lethal prostate cancer.

Led by Lenore Arab, Ph.D., researchers at UCLA's Jonsson Comprehensive Cancer Center (JCCC) examined the link between adherence to WCRF recommendations and risk of highly aggressive prostate cancer.

Study subjects included 2,212 men ages 40 to 70 with newly diagnosed prostate cancer. Adherence to fewer than four of the eight WCRF recommendations predicted a 38% increased risk of aggressive tumors compared with adherence to four or more recommendations. In particular, eating less than 500 grams of red meat per week or less than 125 total kilocalories per 100 grams of food per day were statistically significant in protecting against highly aggressive tumors.

Each point in a patient's total adherence score corresponded to a 13% reduction in risk of aggressive cancer. A total adherence score of less than 4 predicted an increased risk of aggressive tumors. "Most men are at risk of prostate cancer, but it is the level of aggressiveness of disease that is most clinically relevant," said Arab. "These findings suggest that even men with prostate cancer can take control of their disease and moderate its aggressiveness through diet and lifestyle choices."



Indian gooseberry extract (Capros) may counter endothelial dysfunction in diabetics: RCT

By Stephen DANIELLS, 30-Jul-2013 Nutra Ingredients USA

Daily supplements of an extract from Indian gooseberry (*Phyllanthus emblica*) may improve the health of cells lining the blood vessels, and reduce levels of markers of oxidative stress in type-2 diabetics, according to results of a randomized, double-blind, controlled study.

Twelve weeks of supplementation with 250 or 500 milligrams per day of the extract were found to improve endothelial function in people with type-2 diabetes to a similar level as observed for atorvastatin, researchers report in *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*.

The standardized aqueous extract of *Phyllanthus emblica* (syn. *Embolica officinalis*) are commercialized by New Jersey-based Natreon, and branded as Capros for the food, beverage and dietary supplements market.

Endothelial dysfunction

The endothelium – the thin layer of cells lining the blood vessels – performs many functions including maintaining the suppleness of blood vessels and regulating the activity of neutrophils, white blood cells that form a key part of the immune system. Dysfunction in the endothelium leads to arteries with little suppleness, raising the risk of high blood pressure (hypertension), and arteries that are chronically inflamed, leading to an overabundance of adhesion molecules.

"It has been reported that endothelial dysfunction occurs in patients with diabetes much earlier than the clinical manifestations of vascular complications of the disease," wrote researchers from the Nizam Institute of Medical Sciences in India.

Study details

Newly published findings of a randomized, double-blind, controlled study with extracts from *P. emblica* indicated that the fruit extracts may benefit cardiovascular health in type-2 diabetics.

Pingali Usharani, Nishat Fatima, and Nizampatnam Muralidhar recruited 80 people with type-2 diabetes to participate in their study. The subjects were randomly assigned to one of four groups: One group received placebo, another group received atorvastatin (10 mg per day), and the other groups received Capros supplements with 250 or 500 mg of the extract twice daily.

After 12 weeks of intervention, the results showed that all three active groups experienced significant improvements in a marker of endothelial-dependent vasodilatation called the reflection index. Specifically, the 250 mg and 500 mg Capros groups reduced the reflective index by 2.3 to 9.1%, and by 2.1 to 10.0%, respectively, compared with reductions in the atorvastatin group of between 2.7 and 11.0%.

In addition, levels of malondialdehyde, a marker of oxidative stress, decreased by 23, 28, and 30% for the 250mg Capros, 500mg Capros, and atorvastatin groups, respectively, compared with placebo.

Nitric oxide, a potent vasodilator released by the endothelial, was also significantly increased in the active groups by 43.1% for P. emblica 250 mg, 54.6% for P. emblica 500 mg, and 88% for atorvastatin, compared with placebo, said the researchers.

Increases were also observed in levels of the antioxidant glutathione, compared to placebo, they added.

Levels of inflammatory biomarkers were improved by the active groups, added the researchers, with high sensitivity C-reactive protein levels decreasing by 44.56%, 63.16%, and 64.9% in the 250 mg Capros, 500 mg Capros, and atorvastatin groups, respectively, compared with placebo.

Cholesterol levels were also improved in participants receiving the active interventions, wrote Usharani, Fatima, and Muralidhar.

"In the present study, atorvastatin and a proprietary P. emblica extract containing emblicanin A, emblicanin B, pedunculagin, and punigluconin as bioactives achieved significant improvement in endothelial function and a reduction in biomarkers of oxidative stress and systemic inflammation," wrote the researchers.

"Addition of P. emblica to the currently available antihyperlipidemic agents may augment the activity of the statins and offer significant protection against atherosclerosis and coronary artery disease."

A spokesperson for Natreon told us that the new study indicated that the Capros, a single ingredient derived from edible fruits, has properties to support cardiovascular health by improving endothelial function and endothelial biomarkers, reducing total, LDL and VLDL cholesterol, triglycerides and hsCRP, increasing HDL, and improving blood flow. *"Six additional studies to support these claims will be published soon,"* they added.



Many ingredients, many strategies: The 'complex nature' of salt reduction

By Caroline Scott-Thomas, 25-Jul-2013 Food Navigator

Ingredients and strategies for reducing salt are much more complex than those available for reducing sugar, according to analyst insight from Euromonitor International.

Food and drink makers looking for ways to reduce sugar and retain sweetness – as opposed to replacing sugar altogether – have a limited number of options, and the preference in recent years has been stevia-derived sweeteners, as companies tap into positive consumer perception of plant-based ingredients. Monk fruit is set to follow, with its different functionality, according to Euromonitor food analyst Deborah Cross. Writing on the market research organisation's blog, Cross said: *"Both ingredients thrive on their natural, zero calorie credentials in the overall market. However, the necessity for manufacturers to use a range of ingredients and technologies in reducing sodium further illustrates the complex nature of this market and highlights achievements already made, where as much as 40% sodium has already been removed from some food products."*

Taste, function and shelf life

Indeed, there is still no ingredient that can match salt (sodium chloride) in terms of taste, function and shelf life, although there are many ingredients that offer some kind of compromise. Mike Kagan, technical manager for Cambrian, spoke with FoodNavigator last week about the use of Scelta Mushrooms' Camlow ingredients for salt reduction. He said that potassium chloride – still a mainstay in salt reduction – is "old technology".

Referring to bread in particular, Kagan said that Camlow mushroom-based ingredients enhance the other flavours in savoury and baked goods, and are incorporated by using calcium chloride as a carrier, avoiding the bitter, metallic flavours associated with potassium chloride. *"The chloride is the most important part for structure, but the flavour is much better than potassium chloride,"* he said.

No magic ingredient

However, while there are plenty of interesting options, there is no 'magic ingredient' for reducing salt while retaining its flavour and function, says Cross, who suggests that industry could communicate better to speed salt reduction. *"Potentially, a reformulation problem faced by one particular manufacturer has already been solved by another. Any single manufacturer may not have a bird's eye view of how best to resolve the issue, and this is where the government liaison body can help,"* she said.

The World Health Organisation (WHO) hopes to reduce salt consumption by 30% by 2025 – to bring national consumption levels to less than 5 g per person per day, its maximum recommended intake for optimal health.

Covert or overt reduction?

The way in which manufacturers have responded to the WHO and national goals varies by country. In Spain and the Netherlands, food companies are reducing salt without mentioning it to consumers, while in the UK, companies increasingly are telling consumers about salt reduction. *"This may reflect differences in consumer acceptance of reduced sodium products between countries, but suggests that with the right consumer education, direct marketing of products positioned with a reduced sodium content may be possible,"* Cross said.

According to Euromonitor data, sales of reduced salt products have been growing at an average of 10% a year since 2008, outpacing sales of reduced sugar products, which have been growing at 2% a year. The market researcher says that most growth in the reduced salt product category largely has been driven by innovation in Western Europe.



Maternal 'junk food diet' may alter baby's brain development

By Nathan Gray, 31-Jul-2013 Food Navigator

Eating a junk-food filled diet during pregnancy may affect the development of brain pathways in developing babies, permanently altering responses to foods that are high in fat and sugar, say researchers.

The animal research, due to be presented at the Annual Meeting of the Society for the Study of Ingestive Behaviour (SSIB), suggests that consumption of unhealthy 'junk foods' during pregnancy alters the development of opiod pathways in offspring - leading to permanently modified brain signalling in response to foods that are high in sugar and fat.

Led by Jessica Gugusheff from the FoodPlus research centre at the University of Adelaide, the research team used rat models to investigate the effects of junk food consumption during pregnancy, finding that the gene encoding one of the key endogenous opioids - enkephalin - is expressed at higher levels in the babies of mothers who consumed a high level of 'junk food' than in the offspring of mothers who ate standard rat feed. Gugusheff and her colleagues explained that this leads to offspring that are less sensitive to opioids, and means these babies will have to eat more junk foods get the same 'feel good' response - so leading to a higher consumption of high-fat and high-sugar foods.

"The results of this study will eventually permit us to better inform pregnant women about the enduring effect their diet has on the development of their child's lifelong food preferences and risk of negative metabolic outcomes," said Gugusheff.

Study details

Gugusheff and her colleagues analysed the effects of a junk food diet in rats by investigating their responses to the opioid antagonist naloxone in the offspring of rats fed either a standard rat feed diet or a 'junk food' diet. The team found a significant interaction between maternal diet and the expression of opioid genes.

"These results suggest that perinatal exposure to a junk food diet alters the response of the mesolimbic reward pathway to opioid receptor blockade and may indicate functional consequences on the regulation of opioid signaling in junk food exposed offspring," concluded the research team.



Garlic reduces lung cancer risk by 44%, suggests study

By Annie-Rose Harrison-Dunn, 12-Aug-2013 Nutra Ingredients



Consuming raw garlic could serve as a protective factor against lung cancer, even for smokers, suggests a new study by Chinese scientists.

Researchers at the Jiangsu Provincial Centre for Disease Control and Prevention claim to have found a protective association between the intake of raw garlic and lung cancer, advocating that, *"garlic may potentially serve as a chemopreventive agent for lung cancer."* The study suggests even smokers can reduce their risk of lung cancer by around 30% by eating raw garlic two or more

times a week. Around 86% of lung cancer deaths in the UK are caused by tobacco smoking, according to Cancer Research UK.

The researchers conducted face-to-face, standardised interviews in China with 1,424 lung cancer patients and 4,543 healthy controls which aimed to find out about participants' lifestyles and diets - in particular how much garlic they ate and whether they smoked. In the past garlic has been linked with cardiovascular and immune system health. According to the researchers the *"effective components in garlic in lung cancer chemoprevention warrant further in-depth investigation."*

Supplement opportunities

The researchers suggested that diallyl sulphide - a compound released when a garlic bulb sprouts into cloves - may be at the root of garlic's preventative potential. Diallyl sulphide is a breakdown of allicin, an antibiotic and anti-fungal compound largely depleted by cooking or pickling.

While the study concentrated primarily on garlic in its raw state, it can also be consumed in tablet, oil, powder, aged and cooked form. Garlic (*allium sativum*) is an important ingredient of Chinese medicine and can be found within many traditional herbal remedies and traditional Chinese medicines (TCMs).

Yet proclamations of these health properties can be found outside of China too. The World Health Organisation's guidelines recommend a dose of around one clove of fresh garlic for adults per day. While garlic tablets are a licensed drug in Germany, where they are prescribed for the treatment of atherosclerosis. According to Euromonitor International, China produced 13,719,1000 tonnes of the world's 17,789,7000 tonne supply of garlic in 2012.



A Pint of Beer May Benefit Heart Health

July 8, 2013 Food Product Design

ATHENS, Greece—Sipping a pint of beer may improve heart health by increasing flexibility and blood flow in major arteries around the heart, according to a new study published in the journal *Nutrition*.

Researchers from Harokopio University in Athens studied the cardiovascular health of 17 non-smoking men in their late twenties and early thirties two hours after subjects drank 200mL of beer. Endothelial

function, a measure of how easily blood passes through arteries, significantly improved after beer consumption.

When researchers repeated the same experiment with vodka and alcohol-free beer, results were slightly different. While all three drinks provided some benefits on artery stiffness, beer containing alcohol worked the best on endothelial function.

The combination of alcohol and antioxidants in beer may contribute to these results, researchers said. "Beer acutely improves parameters of arterial function and structure in healthy non-smokers," they added. "This benefit seems to be mediated by the additive or synergistic effects of alcohol and antioxidants, and merits further investigation."

Consumers continue to drive the demand for their favorite alcoholic brands, earning beer a first place ranking in the highest-growth category on the 2013 Brandz Top 100 list. While the drink may be beneficial in moderation, previous research shows binge drinking may raise the risk for diabetes.



High-Fiber Diets Decrease Diabetes, CVD Risk

July 3, 2013 Food Product Design

HOUSTON—A diet high in fiber and whole grains can help lower the risk of developing diabetes and heart disease, according to new research published in *The American Journal of Clinical Nutrition*.

The research involved an analysis of 28 studies that linked lowered diabetes risk and whole grain consumption, 33 studies on the risk of cardiovascular disease and 19 on obesity. Evidence from these studies suggests foods rich in cereal fiber or mixtures of whole grains and bran are "modestly associated" with a reduced risk of obesity, diabetes and cardiovascular diseases.

Components in whole grains have the ability to block two very low-density lipoproteins (VLDLs), triglyceride and apolipoprotein CIII (apoCIII), both of which have been shown to increase the risk of heart disease. Also, because whole grains have a lower glycemic index compared to refined grains, they may aid in weight loss and management.

Researchers said the strongest evidence for health benefits came from cereal fiber, including breakfast cereals, breads and brown rice with high fiber content. People who ate the most cereal fiber or whole grains and bran lowered their diabetes risk by about 18% to 40% compared to those who ate the least. Similarly, people who consumed the most cereal fiber had a 22% to 43% lower risk of stroke, and a 14% to 26% lower risk of cardiovascular diseases.

Fiber-rich grains also linked to lower body weights, but only to a small extent.



Study: High Glycemic Foods May Trigger Food Addiction

July 3, 2013 Food Product Design

BOSTON—High-glycemic foods may trigger the same brain mechanism tied to addiction, according to a study published in *The American Journal Of Clinical Nutrition*.

Researchers from the Boston Children's Hospital found that consuming highly processed carbohydrates can cause excess hunger and stimulate brain regions involved in rewards and cravings. Such findings suggest that limiting high glycemic index foods could help obese individuals avoid overeating. "Beyond

reward and craving, this part of the brain is also linked to substance abuse dependence, which raised the question as to whether certain foods might be addictive," said David Ludwig, M.D., Ph.D., lead author of the study, director, New Balance Foundation Obesity Prevention Center.

In an examination of this link, researchers measured blood glucose levels and hunger, while also using functional magnetic resonance imaging (MRI) to observe brain activity during the crucial four-hour period after a meal, which will influence eating behavior during the next meal. Researchers had 12 overweight or obese men consume test meals designed as milkshakes with the same calories, taste and sweetness.

However, one milkshake contained rapidly digesting (high-glycemic index) carbohydrates and the other had slowly digesting (low-glycemic index) carbohydrates. Results showed that compared to those who consumed the low-glycemic index milkshake, participants who had consumed the high-glycemic index milkshake experience an initial spike in blood sugar levels, followed by a sharp crash four hours later. This decrease in blood glucose was associated with excessive hunger and intense activation of the nucleus accumbens, which is a critical brain region involved in addictive behaviors. "These findings suggest that limiting high-glycemic index carbohydrates like white bread and potatoes could help obese individuals reduce cravings and control the urge to overeat," said Ludwig.

Further, findings suggest that there is a need for more interventional and observational studies to be done. Future research may inform clinicians about the subjective experience of food addiction and how such patients are treated and in terms of regulating their weight.

For more information on how the brain is affected by food visit Brain's Pleasure Responses From Food Measured Through Eyes.



Fatty acids may reduce breast cancer risk

A study published in *BMJ* shows that eating oily fish such as salmon, tuna, or sardines may help reduce the risk of breast cancer. These fish contain a type of fatty acid known as n-3 polyunsaturated fatty acids (PUFAs).

The researchers reviewed 21 different studies that looked at the intake of fish and PUFAs among 883,585 women in the United States, Europe, and Asia. Among those women, 20,905 had breast cancer. The follow-up time varied, from four years to 20.

The researchers found that PUFAs from marine sources were associated with 14% reduction of risk of breast cancer, and the relative risk remained similar whether marine n-3 PUFA was measured as dietary intake or as tissue biomarkers. For every 0.1-g-per-day increase in the intake of the fatty acids, there was a 5% lower risk of breast cancer, the study found. No significant association was observed for fish intake itself or exposure to alpha linolenic acid.

The researchers concluded that "Higher consumption of dietary marine n-3 PUFA is associated with a lower risk of breast cancer. These findings could have public health implications with regard to prevention of breast cancer through dietary and lifestyle interventions."

IFT Weekly July 10, 2013



Colorectal Cancer Linked to Diet Rich in Sugar, Fat

July 16, 2013 Food Product Design

EDINBURGH, Scotland—Eating a diet high in sugar and fat has been linked to bowel cancer, according to researchers from the University of Edinburgh.

The team of researchers examined diet, levels of physical activity and smoking patterns in a large group of males and females. Data was used from the Scottish Colorectal Cancer Study, which took place in 2012. More than 170 foods were studied including a healthy diet filled with fruits, vegetables, and other healthy foods, and the other diet high in fat and sugar.

Soft drinks, cakes, cookies, chips and desserts all fall under the high sugar, high fat category making bowel cancer more prominent in individuals than those with a healthier diet.

"What we have found is very interesting and it merits further investigation using large population studies. While the positive associations between a diet high in sugar and fat and colorectal cancer do not automatically imply 'cause and effect', it is important to take on board what we've found – especially as people in industrialised countries are consuming more of these foods," said Dr. Evropi Theodoratou, lead researcher of the study.



Rice and whey protein may equally help build, repair muscle

A study published in *Nutrition Journal* shows that plant-based rice protein may be comparable to animal-based whey in its ability to build and repair muscle. Consumption of moderate amounts of animal-derived protein has been shown to differently influence skeletal muscle hypertrophy during resistance training when compared with nitrogenous and isoenergetic amounts of plant-based protein administered in small to moderate doses. Therefore, the purpose of the study was to determine if the post-exercise consumption of rice protein isolate could increase recovery and elicit adequate changes in body composition compared to equally-dosed whey protein isolate if given in large, isocaloric doses.

The researchers divided 24 college-age, resistance-trained males into two groups—either consuming 48 g of rice or whey protein isolate (isocaloric and isonitrogenous) on training days. Subjects trained three days per week for eight weeks as a part of a daily undulating periodized resistance-training program. The rice and whey protein supplements were consumed immediately following exercise. Ratings of perceived recovery, soreness, and readiness to train were recorded prior to and following the first training session. Ultrasonography determined muscle thickness, dual emission x-ray absorptiometry determined body composition, and bench press and leg press for upper and lower body strength were recorded during weeks 0, 4, and 8.

The researchers found that there were no detectable differences in psychometric scores of perceived recovery, soreness, or readiness to train between those taking rice and those taking whey protein. They concluded that both whey and rice protein isolate administration post resistance exercise improved indices of body composition and exercise performance; however, there were no differences between the two groups.

IFT Weekly July 17, 2013



Increased Choline Consumption Improves Memory

July 11, 2013 Food Product Design

GRANADA, Spain—Consuming choline, a vitamin B group nutrient found in eggs, meat, soy and wheat germ, has been shown to improve long-term memory and attention holding capacity, according to a study conducted at the University of Granada, Spain, Simon Bolivar University, Venezuela and the University of York, United Kingdom.

Researchers studied supplements in two experiments aimed at analyzing the influence of vitamin B intake on memory and attention during gestation and in adults.

During the first experiment, rats received choline during the third term of gestation. Three groups were fed choline-rich foods. When the offspring reached an adult age, a sample of 30 were selected consisting of 10 female offspring who were fed a choline supplement, 10 who followed a choline-deficient diet and 10 who followed a regular diet.

Measurement of memory retention were taken 24 hours after being shown an object to all of the offspring. After 48 hours, the rats of dams fed a prenatal choline-rich diet recognized the object better than those in a standard group while those with a choline-deficient group didn't recognize the object at all.

The second experiment measured change in attention that occurred in adult rats fed choline supplement for 12 weeks versus those with no choline intake. The rats that consumed choline had better attention then others when presented with a familiar stimulus. Those fed a standard diet showed normal learning delay but those with choline-rich intake showed a fall in attention to the familiar stimulus, learning its new meaning.

A recent study showing an increased choline consumption during pregnancy also demonstrated a decrease in an infant's vulnerability to stress-related illnesses, such as mental health disturbances and chronic conditions like hypertension.



Infants fed DHA-enriched formula may have increased cognitive performance

A study published in the *American Journal of Clinical Nutrition* shows that infants who are fed formula enriched with long-chain polyunsaturated fatty acids (LCPUFA) in their first year of life may experience better cognitive development later in childhood.

In the randomized, double-blind study, 81 infants were fed one of four formulas from birth to 12 months; three with varying levels of two LCPUFAs (DHA and ARA) and one formula with no LCPUFA. Beginning at 18 months, the children were tested every six months until six years of age on age-appropriate standardized and specific cognitive tests.

At 18 months, the children did not perform any better on standardized tests of performance and intelligence, but by age three the researchers began to see significant differences in the performance of children who were fed the enriched formulas on finer-grained, laboratory-based measures of several aspects of cognitive function. Specifically, the children showed accelerated development on detailed tasks involving pattern discrimination, rule-learning, and inhibition between the ages of three to five years of age as well as better performance on two widely-

used standardized tests of intelligence: the Peabody Picture Vocabulary Test at age five and the Weschler Primary Preschool Scales of Intelligence at age six.

IFT Weekly Aug 21, 2013



Immune Support: Playing Good Defence

Trends show an ounce of prevention is worth a pound of cure.

In fast paced world, everyone is under constant pressure. With worries of economic downfalls, growing financial hardships, environmental deterioration and new super viruses, each is bombarded by anxiety, toxins, pathogens and overwhelming personal and professional demands. Immune support has hence become an important focus for consumers.

Immune support is poised for significant growth. Interest in healthy immunity has increased as consumers recognize its role in everything from reducing risk of illness and chronic disease to staving off signs of aging. Antioxidants from superfruits and tea extracts currently predominate in immune-boosting foods and beverages, foreseeable future will have more novel formulations and evidence-based products. The common denominator in immune support is stress and its impact on our bodies.

We hear about stress in media and we feel its effects. Emerging science indicates close relation between external stressors on the body (e.g. physical, emotional, psychological, environmental, and microbial) and their effects on health. The purchase power with consumers is limited so they are looking for products that can cover more problems. There are new products offering additional health benefits consumers are looking for on a daily basis, in particular stress reduction, which is related to healthy immune defenses.

Consumers are looking for maintaining healthy condition. Rather than depend on healthcare, they are turning to natural products that are less expensive and have far fewer side effects. Natural products are a viable complement to traditional medicine. Diabetes, gut disorders and many autoimmune conditions are common and can be ameliorated through natural products. A healthy immune system protects consumers from many such conditions. Moms are looking to protect their kids from colds during school season and large aging population is looking to maintain good health. The market for such products is ready for expansion.

Understanding Health Obstacles

Healthy diet, exercise and plenty of rest help maintain overall health, but extra measures are needed to combat stresses and health threats that are out of control. Over-exposure to stress can raise cortisol levels in body weakening the immune system. Also excess of key vitamins like A, C and E as well as carotenoids and flavonoids can have negative effect on health.

The immune system is the body's defence against all challenges. It is a complex network of millions of immune cells and chemical mediators that protect the body. These networks and processes protect us

from pathogenic diseases and even tumour cells. Distinguishing our own healthy cells from invading agents and tumour cells is what protects us from autoimmune disease. Keeping them primed so they would be useful when needed is the purpose of supplements and nutraceuticals.

Skin is the largest organ system that is part of immune system, serving as a barrier to infections. The GI tract is another major defence system often killing food-borne pathogens. Lungs have the ability to fight off harmful pollutants and airborne pathogens and viruses. Internally white blood cells, liver etc. help fight off viruses and bacteria to various toxins coming through foods. When kept healthy, skin, membranes, cells, enzymes and hormones send the appropriate signals and messages to protect our body from invading diseases and infections. Healthy immune system keeps the whole network active. There is increasing evidence that internal 'microbiome' and the immune system are linked and work together to maintain the state of total health.

Natural Approaches

Vitamins & Minerals: Some common nutrients like vitamins and minerals support immune function. Zinc and vitamins A, C and D have been shown to boost immune system during times of sickness. While body's demand for zinc is higher when the immune system has been activated, even a slight deficiency is associated with limited immune response and thus can lead to increased susceptibility to infections. Zinc is integral to maintaining healthy skin and plays a key role in cellular immunity, which is needed to fight off infectious invasions.

Minerals like selenium are also important in immune support. They can play an important role in supporting a healthy immune system. Deficiency of selenium can result in immuno-suppression leading to lower resistance against microbial infections. Magnesium is a key metallic catalyst in the conversion of essential fatty acids to prostaglandins, which are necessary in a wide variety of inflammatory processes that defend against arthritis and metabolic syndrome.

Herbs, Botanicals & Superfruits: These are becoming popular to counter immune system problems like inflammation, allergies and fatigue. Herbs like Echinacea and ginseng are getting included in immune health category with other herbs are also getting recognition. These may help in two ways. Tonics strengthen and build the immune system over time, while immune system stimulants have a more immediate action and are used during acute infection.

Extracts from herbs can boost the immune system. Curcumin complex derived from Indian spice turmeric is a powerful anti-inflammatory, antioxidant and immunomodulator, and helps to reduce inflammation and bring the immune system to normalcy. Ashwagandha extract strengthens body's defence system to guard from the stressors that affect the immune system.

Botanicals like aloe also play a role in immunity. Aloe vera has been studied for its ability to support immune system keeping it healthy. It is used topically as well as consumed and used safely for many decades. Medicinal mushrooms are also considered for immune support. Mushroom extracts from Chinese medicines like *Cardiiceps sinensis* and *Ganoderma lucidum* are used for their immune support benefits.

Antioxidant-rich superfruits are considered in immune support category for their ability to reduce oxidative stress and thereby suppress diseases. In gut health, antioxidants are expected to provide indirect support to immune system. Studies with anthocyanin effects on specific immune cell-types suggest that they could have more direct effect on immunity as well. Healthy older patients consuming grape juice showed an increase in immune cells with both effector and suppressor functions located in the epithelial lining of the gut.

In vitro study with anthocyanin-rich blackcurrant extracts, it was observed that oxidation stress was reduced suggesting that extracts could complement the benefits of exercise to immunity. In human trials involving runners, blueberry consumption reduced inflammatory markers while increasing natural killer (NK) cell counts significantly.

Friendly Bacteria & Dietary Fibres: Normal intestinal function and colonic integrity are critical to maintaining digestive and immune health. Colon contains over 3 pounds of bacteria that are intimately associated with their host tissues and known to affect structure and function of these tissues.

Dietary fibres like fructo-oligosaccharides have been shown to produce short chain fatty acids which promote protective effect on the gut as well as increase gut integrity, improve normal bowel function, and improve nutrient metabolism and absorption.

Probiotics market is expected to exceed \$22 billion in 2013, representing compound annual growth rate (CAGR) of 12% between 2004 and 2013. The benefits of fermented food cultures have become better known during last decade by more consumers who are looking for probiotics and prebiotics to support their digestive health.

Immune health is the second largest health area after intestinal health. Several trends are showing consumer interest toward immune and digestive health especially aging population. With many of these becoming even more important in future, this is a growing market to tap. Functional foods and dietary supplements with digestive and immune benefits are becoming more relevant.

Gut is the first line of defence so much of overall health starts there. Probiotics are also responsible for producing B vitamins that body needs and produce enzymes that digest other food that is consumed.

Fermentable prebiotics are also known to aid in stimulation of growth and activity of beneficial bacteria in the intestine which also produce short chain fatty acids. These provide energy for the colon cells, increase absorption of some minerals and trigger important biochemical pathways linked to a range of health benefits.

Fucoidans, Yeast & Beta-Glucans: In future, ingredients positioned to be connected with healthy whole foods e.g. beta-glucans and fucoidans will be more successful as consumers find confidence in the efficacy of natural active ingredients from them presumed to provide immune support. Polysaccharides like fucoidans from kelp are presumed to provide health benefits like digestive and immune health. Bakers' yeast and its beta-glucan products also boast of immune benefits. One proprietary yeast beta-glucan is presumed to engage neutrophils, immune cells of body, for locating

and destroying foreign challenges. As neutrophils are short-lived and body makes new ones that require priming.

Another yeast ingredient targeted towards immune support is dried yeast fermentate containing metabolites which are supposed to nourish body. It balances immune system against different stressors before immune-related issues develop.

Looking Ahead: Emerging Opportunities

US Baby Boomers are driving trends in immune support market. This group is almost 80 million born between 1946 and 1964 plus additional part of net immigration. Another increasing factor is growing consumer awareness of importance of prevention and healthy lifestyle in feeling well as you age. Population with age 65+ is expected to grow to 19% by 2030 i.e. about additional 72 million people in that age group. Aging is associated with higher susceptibility to infection resulting in demand by this group for supplements targeting immune health.

As awareness of wellness and health increases, immune category is likely to become a year-round market rather than significant only during cold and flu season. Many stores divide their aisles into separate 'Cold & Flu' and 'Immune Support' sets. The trend linking immune support to health and wellness will continue. To meet increasing demands, suppliers and producers of supplements are looking to position their products for specific needs and desires of their customers targeting towards specific immune support concerns e.g. products to reduce upper respiratory symptoms that commonly affect high performance athletes.

Some companies take opposite approach. Rather than focusing on specific immune concerns, they are looking to cover a broad range of health issues with their products. Whatever the goal, it will need clinical research to get there. Products that best respond to these trends will be supported by credible human clinical research. Multiple peer-reviewed studies demonstrating the safety and efficacy are needed for finished products as well as health ingredients.

Condensed from article by **Lisa Olivo in Nutraceuticals World September 2012**



Food Safety & Regulatory News

U.S. FDA takes step to help ensure the safety of imported food

On July 26, the U.S. Food and Drug Administration (FDA) issued two proposed rules as part of the Food Safety Modernization Act (FSMA) aimed at helping to ensure that imported food meets the same safety standards as food produced in the United States.

Under the proposed rules, importers would be accountable for verifying that their foreign suppliers are implementing modern, prevention-oriented food safety practices, and achieving the same level of food safety as domestic growers and processors. The FDA is also proposing rules to strengthen the quality, objectivity, and transparency of foreign food safety audits on which many food companies and importers currently rely to help manage the safety of their global food supply chains.

The new measures respond to the challenges of food safety in today's global food system. Imported food comes into the U.S. from about 150 different countries and accounts for about 15% of the U.S. food supply, including about 50% of the fresh fruits and 20% of the fresh vegetables consumed by Americans.

Under the proposed regulations for Foreign Supplier Verification Programs (FSVP), U.S. importers would, for the first time, have a clearly defined responsibility to verify that their suppliers produce food to meet U.S. food safety requirements. In general, importers would be required to have a plan for imported food, including identifying hazards that are reasonably likely to occur. Importers would be required to conduct activities that provide adequate assurances that these identified hazards are being adequately controlled.

"FSMA provides the FDA with a modern tool kit that shifts the paradigm for imports, as well as domestic foods, from a strategy of reaction to one of systematic prevention," said Michael R. Taylor, Deputy Commissioner for Foods and Veterinary Medicine. "Rather than relying primarily on FDA investigators at the ports to detect and respond to food safety problems, importers would, for the first time, be held accountable for verifying, in a manner transparent to the FDA, that the food they import is safe."

FSMA also directs the FDA to establish a program for the Accreditation of Third-Party Auditors for imported food. Under this proposed rule, the FDA would recognize accreditation bodies based on certain criteria such as competency and impartiality. The accreditation bodies, which could be foreign government agencies or private companies, would in turn accredit third-party auditors to audit and issue certifications for foreign food facilities and food, under certain circumstances. Importers will not generally be required to obtain certifications, but certifications may be used by the FDA to determine whether to admit certain imported food that poses a safety risk into the U.S.

The FSVP proposed rule and the third-party accreditation proposed rule are available for public comment for the next 120 days. The two proposed rules will help the FDA create an integrated import oversight system that works efficiently to improve food safety and protect the public health.

These proposals work in concert with the proposed rules released in January 2013, for produce safety and preventive controls in facilities that produce human food. Those proposed rules are currently open for comment until September 16, 2013, but the FDA intends to grant a 60-day final extension of the comment period to allow commenters an opportunity to consider the interrelationships between the January proposals and the two proposals just announced.

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FDA Issues Draft Guidance for Medical Foods

August 13, 2013 Food Product Design

The U.S. Food and Drug Administration (FDA) today issued a revised Draft Guidance (Second Edition) for FAQs about Medical Foods and has opened the comment period until Oct. 15, 2013 for industry or the public to weigh in on the document.

The 60-day comment period after the date of publication is scheduled prior to FDA work on the final version. The Draft Guidance (Second Edition) is not yet available on the FDA's Web site. While guidance documents from FDA provide insight into FDA's likely application of the laws and regulations, they guidance is not itself law, but FDA interpretation of the law.

FDA issued the first edition of this guidance in May 2007. The draft guidance provides responses to additional questions regarding the definition, labeling and availability of medical foods and updates to some of the existing responses.

Medical foods are defined in section 5(b)(3) of the Orphan Drug Act (21 U.S.C. 360ee(b)(3)) as foods formulated to be consumed or administered orally or enterally under the supervision of a physician. Medical foods are intended for the specific dietary management of a disease or condition for which distinctive nutritional requirements, based on recognized scientific principles, are established by medical evaluation. FDA criteria to clarify the statutory definition of a medical food is in FDA regulations at 21 CFR 101.9(j)(8). FDA lists exemptions in the FAQs.

Medical foods are specially formulated and processed for a patient who has a limited or impaired capacity to ingest, digest, absorb, or metabolize ordinary food or certain nutrients, or who has other special medically determined nutrient requirements that cannot be met by modification of a normal diet alone. Medical foods are not those foods simply recommended by a physician as part of an overall diet to manage the symptoms or reduce the risk of a disease or condition like diabetes, for example.

FDA invites interested persons to submit comments by October 15, 2013. To submit comments electronically visit: <http://www.regulations.gov>. FDA has several issues open for comments at this time, including FSMA.



EFSA panel says advantame is safe for use

By Caroline Scott-Thomas, 01-Aug-2013 Food Navigator

The European Food Safety Authority (EFSA) has concluded that aspartame-derived sweetener advantame is safe for human consumption.

The sweetener and flavour enhancer has been developed by Ajinomoto and is reportedly 37,000 times sweeter than sugar. It is derived from aspartame and vanillin, with a sweet taste similar to aspartame but with a slightly longer sweetness duration.

EFSA noted that advantame is stable under normal storage conditions, but that there is some instability in acidic beverages and heat-treated foods. The ingredient and its main metabolite have been tested in mice, rats, rabbits, dogs and humans, and have been found to be poorly absorbed by the body.

The panel concluded that advantame is not of concern with regards to genotoxicity and carcinogenicity. The only critical effect observed in animal studies was gastrointestinal disturbance in one prenatal study in rabbits. The no observed adverse effect level (NOAEL) for this effect was 500 mg of advantame per kilogram of bodyweight per day.

Based on this finding, the panel built in a 100-fold uncertainty factor when setting maximum consumption levels for humans, and established an acceptable daily intake (ADI) of 5 mg per kilogram of bodyweight per day.

“Conservative estimates of advantame exposure for high level adults and children consumers were below the ADI for the proposed use levels,” it said. “...Advantame was well tolerated in single or repeated doses up to 0.5 mg/kg bw/day by normo-glycemic or diabetic subjects.”

Ajinomoto says that advantame can also be used to enhance flavours like dairy, fruit, citrus and mint, can be used to extend sweetness duration in chewing gum and improve the sweetness profile of confectionery products.



FDA allows natural blue from spirulina as food coloring

The U.S. Food and Drug Administration (FDA) has amended the color additive regulations to provide for the safe use of spirulina extract made from the dried biomass of the cyanobacteria *Arthrospira platensis*, as a color additive in candy and chewing gum. This action is in response to a petition filed by Mars Inc. in January 2012.

Spirulina is a blue-green filamentous cyanobacteria that occurs naturally in freshwater and marine habitats. It has a long history as a food in many countries. Spirulina contains chlorophyll and phycobilins, which absorb sunlight and have a role in photosynthesis. The phycobilins found in spirulina are phycocyanins, which are blue and, together with chlorophyll, give spirulina its characteristic blue-green color.

The FDA has determined that because the amount of the color additive used in food is self-limiting, there is no need for a specific upper limit for the color additive or phycocyanin content. Therefore, the FDA is limiting the use of spirulina extract in candy and chewing gum to amounts consistent with good manufacturing practice. In addition to specification limits for lead, arsenic, and mercury, the FDA requires that the color additive be negative for microcystin toxin, which is produced by some species of cyanobacteria that could be potentially present in the water where *A. platensis* is grown and harvested.

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Food Science & Industry News

Spicing Up Food Can Make Up for Missing Fat

July 15, 2013 Science Daily

Adding just a small amount of everyday herbs and spices to vegetables and reduced-calorie meals may make those foods more appetizing to consumers, which could ultimately help Americans cut down on dietary fat and choose more foods in line with the Dietary Guidelines for Americans, according to research presented at the 2013 Institute of Food Technologists (IFT) Annual Meeting & Food Expo®

John Peters, Ph.D., professor of medicine at the University of Colorado and chief of strategy and innovation at the school's Anschutz Health and Wellness Center, presented data from an experiment he conducted using meatloaf, vegetables and creamy pasta. The test group of 150 subjects tasted the meal with full fat (610 calories), reduced fat, and reduced fat with everyday spices added such as onion, oregano, paprika and garlic (both 395 calories). They then rated the meals using a nine-point Likert scale. The meals were randomized so nobody knew which of the three they were eating.

The analysis of the experiment found:

- The full-fat meal and the reduced-fat meal with spices both scored the same (about a 7.0). The reduced-fat meal with no spices scored about a 6.25. Peters noted that simply adding herbs and spices was enough to improve the reduced-fat version enough that it was rated as highly as the full-fat version.
- The reduced-fat meatloaf with spices scored slightly higher than the full-fat version (6.75 vs. 6.50), while the reduced-fat only version was rated just above 6.0.
- The spiced-up reduced-fat vegetables scored slightly above 7.0, while the full-fat version scored just under 7.0. The reduced-fat only vegetables scored a little below 6.5.
- The full-fat creamy pasta was still more favored, scoring slightly above 7.25 vs. a little above 6.5 for the spicy reduced-fat version, and slightly below 6.0 for the reduced-fat with no spice.

Peters says reducing the fat in components like milk and cheese may contribute to an overall less satisfying feel and taste. Still, he noted that adding spices made up some of the ratings deficit between the full-fat version and the non-spicy reduced-fat version.

Peters urged the food industry to continue studying the relationship between herbs and spices and dietary satisfaction.

"Substituting herbs and spices for fat may be a promising strategy for helping people meet the Dietary Guidelines, especially if it's simple stuff you can buy in the store that doesn't require any exotic training," said Peters, whose research was funded in part by the McCormick Science Institute. The Institute is an independent research organization whose mission is to support scientific research and disseminate information on the health benefits of culinary herbs and spices. Spice manufacturer McCormick & Company, Inc., supports the initiatives of the McCormick Science Institute through funding.



Taste Rules for Kids and Healthy Food Choices

July 16, 2013 Science Daily

Sweet and salty flavors, repeat exposure, serving size and parental behavior are the key drivers in children's food choices, according to a July 15 panel discussion at the 2013 Institute of Food Technologists (IFT) Annual Meeting & Food Expo® held at McCormick Place.

A standing-room only crowd of more than 200 conference attendees heard new insights into how children choose the foods they eat, what their eating behaviors are and how the industry and parents can give children access to healthy food environments that shape those food choices.

"Children's decision making has few dimensions," explained Dr. Adam Drewnowski (CQ), director of the Center for Public Health Nutrition and professor of epidemiology at the School of Public Health, University of Washington, Seattle. Not surprisingly, children lean toward sweets like cookies, chocolate, fruits and juices as well as salty foods that make them feel full like French fries and pizza. But environment, peer groups, family, and exposure to a variety of menu items play a key role in children's food choices.

"Kids are not as complicated as adults and are not making food choices based on health," said Dr. Jennifer Orlet Fisher, an associate professor of public health at Temple University, Philadelphia. "Preference trumps all. Children eat what they like and leave the rest."

In her studies, she found children like fat and sugar and somewhat surprisingly, fruit is at the top of the list of food choices, followed by starches, meat and eggs, dairy and vegetables. She said it's not surprising kids like candy and cake over peas and carrots.

"Children do not naturally like healthy foods. They need to learn to like those healthy foods," Fisher said. "They also like what they know."

Repeat exposure creates a food familiarity that also drives food choices for children, which explains why many children repeatedly choose chicken nuggets and cheese, as she found in a study of preschoolers. Taste preferences are evident shortly after birth, with children preferring sweet and salty tastes first and rejecting bitter and sour tastes.

With that familiarity, she said, often comes food neophobia, better known as the picky eater, which peaks between two and six years of age when eating habits become established. This can be overcome by presenting small tastes of foods or in the case of one broccoli study, offering a side of ranch dip to entice the child.

Fisher recommends diversifying diets in pregnant and nursing women since diets are determined "long before they taste their first bite of solid food." Parental behavior also drives healthy food choices that are available, accessible and familiar.

"When children are watching adults, they more quickly try new foods and accept new foods particularly when the adult is enthusiastic," Fisher said. "What doesn't work is pressuring kids to eat. And if you bribe kids with dessert, they will end up disliking the vegetables even more."

Parents who also get their kids involved in food preparation and tasting, she said, provide a positive experience to promote acceptance of healthy foods.

