Limitless Innovations, Added Nutritional Benefits

In No-Added Sugar Products using Polyols

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Stressed? Upset? Annoyed? Bored? Or just a major post lunch craving? Almost any excuse can just be a reason enough to gorge on your favorite sweet, be it a pastry, ice-cream, chocolate, *ladduo*r even a handful of sugar is enough to satisfy you sweet cravings. Sugars have long been implicated by successive researches as being responsible for weight gain, dental decay and poor glycemic control amongst diabetics. Yet, it is impossible to dissuade people from having sweets or desserts whenever the sugar craving kicks in.

India has earned the dubious distinction of "diabetes capital of the world". TheInternational Diabetes Federation (IDF) estimates the total number of diabetic subjects to be around 40.9 million in India and this is further set to rise to 69.9million by the year 2025[1]. There is little surprise if rising sugar consumption rings an alarm bell amongst health professionals. This can be demonstrated by several studies which have shown a strong correlation between sugar consumption, obesity and diabetes incidence[2]. In spite of all the noise about the ill-effects of sugar, the per capita demand for total sugar (including *gur* and *khandsari*) has increased at a phenomenal rate from 19.8 kg per annum in 1975-76 to 31.8 kg[3] (19.9 kg from sugar and 9.9 form *gur*and *khandsari*) per annum in 2009-10.

Taking cues from the rising incidence in diabetes, heart disease, obesity and dental caries, major food manufacturers have paced up the production of healthier products or have repositioned the existing lines of sweetened snack foods towards healthier variants. However, formulating healthier but yet appetizing reduced or no-added sugar products is often a major challenge faced by food manufacturers.

Sugar Replacers – Looking beyond Calorie Reduction

No Added sugar foods are based on principle of replacing sugar entirely with sugar substitutes and are sold with the claim of being "diabetic friendly". However, the acceptance continues to be fairly limited as the sugar containing foods still continue enjoy huge popularity. The factors being, lack of awareness among consumers, cost, poor acceptability and even manufacturing difficulties. But with increase amount of researches citing health and technological benefits of polyols, a whole new avenue has opened up for enjoying all our favourite sweets without the risk of weight gain, hyperglycemia and dental decay. A whole range of polyols are available today, varying in sweetness, solubility and cooling effect. Depending on the application, it is up to the food formulator as to which polyol suits with the desired application.

The present article focuses on the health benefits offered by polyols as well as the varied application where they can easily replace sugar.

What are the nutritional benefits of polyols?

What is a polyol?

Polyols, or sugar alcohols, are hydrogenated carbohydrates. Various polyols such as sorbitol, mannitol or xylitol can be found naturally in some fruits or vegetables in a non-insignificant quantity. Others, such as maltitol, are mainly derived from corn or wheat starch after catalytic hydrogenation of the carbonyl group into an alcohol group (figure 1). Polyols are principally used as sugar replacers in food products with a major advantage of bulking effect as compared with intense sweeteners. They are also used in oral care products (toothpastes) or in pharmaceuticals. Polyols can be found either in liquid (syrups) or in crystallized (powder) forms. Moreover, polyols display an energy

cost reduced as compare to sugars. Although sugars caloric value is 4 kcal/g, polyols' one is only 2.4 kcal/g according to the European regulation. Therefore, food containing polyols in substitution for sugars display a reduction of their energy load.

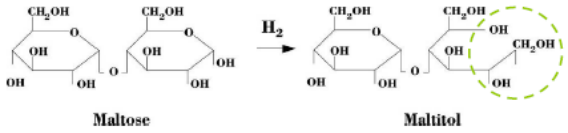


Figure 1: Catalytic Hydrogenation of Maltose to Maltitol

Metabolism: uptake, digestion and tolerance.

The outcome of polyols in the digestive tract varies according to the metabolic pathways followed, their uptake, digestion and excretion.

Monosaccharide type polyols (sorbitol, mannitol, xylitol) are absorbed via passive diffusion mechanism, unlike glucose which is absorbed more rapidly via active transport. The higher the molecular mass, the slower the uptake in the digestive tract. The higher the dose of polyol consumed, the lower the proportion absorbed.

The fraction of polyol digested in the small intestine is either fully metabolized, or fully or partially excreted in urine. The non-digested fraction reaches the colon where it is fermented, stimulating the production of bacterial biomass and fermentation products. For example, maltitol displays 40% of intestinal absorption and approximately 60% of colonic fermentation, whereas erythritol is almost fully absorbed in the small intestine (90%) and consecutively excreted in urine while only a low undigested proportion is fermented in the colon (10%)[4].

Polyols may sometimes cause slight intestinal discomfort (noisy bowels, flatulence). This phenomenon is not specific to polyols and may be caused by the intake of many other natural products (fruits, vegetables) or any source of dietary fiber. Digestive tolerance for polyols, which is characterized by a lack of symptoms after consumption of the product, is depending on individuals but is improved by split and/or regular or progressively increasing consumption. As an example, maltitol and Lycasin® HBC exhibit some of the highest tolerance thresholds, enabling extensive use in adults and in children in various dietary applications[5,6,7]. However, as a precaution, the European regulation stipulates that a warning relating to the laxative effect in the event of excessive consumption be included on labeling for products containing more than 10% polyols.

Glycemic and insulinaemic responses of the polyols: a property for diabetes and obesity prevention.

One of the primary uses of polyols in food products is linked to their low glycemic and insulinaemic indexes. These indexes are based on the physiologic responses, blood glucose and insulin concentrations, following the ingestion of a dose of the polyol and comparing them to the physiologic responses following the ingestion of a same dose of glucose. From a regulatory point of view, the glycemic index has been defined in 1998 by the Food and Agricultural Organization as "the incremental area under the blood glucose response curve of a 50g carbohydrate portion (50g of available carbohydrates) of a test food expressed as a percentage of the response to the same amount of carbohydrate from a standard food taken by the same subject." In case of an unpractical 50g dose of carbohydrate, smaller portions can be used. In this instance, we talk about "glycemic and insulinaemic responses". The glycemic response has been recognized, by the 2005 Dietary Guidelines Advisory Committee, as the effect of carbohydrate-containing foods on blood glucose concentration during the time course of digestion.

The curve of the glycemic response can be divided in four phases. The first one corresponds to a peak of blood glucose concentration, as much intense as the food contains rapidly available glucose. The second phase corresponds to the decrease of the blood glucose concentration consecutively to the secretion of insulin. Following this insulin secretion, a hypoglycemic period is observed in the third phase. In the fourth phase, the blood glucose concentration returns to its baseline. In the case of consumption of a polyol containing food, like maltitol, instead of

a high carbohydrate containing food, the glucose response is modified: during the first phase, the blood glucose concentration peak is much less higher followed by a slower decrease of this concentration over time (phase II). The following hypoglycemic phase (phase III) is almost non-existent and the return to the baseline concentration is delayed (phase IV). As a result of this modified glucose response, consumption of polyol containing food instead of high carbohydrate containing food induces a lower insulin secretion (weaker peak of the insulin blood concentration). Expressed as a percentage of the glucose responses, the glycemic response of a polyol like maltitol is 35 and its insulinaemic response is only 274.

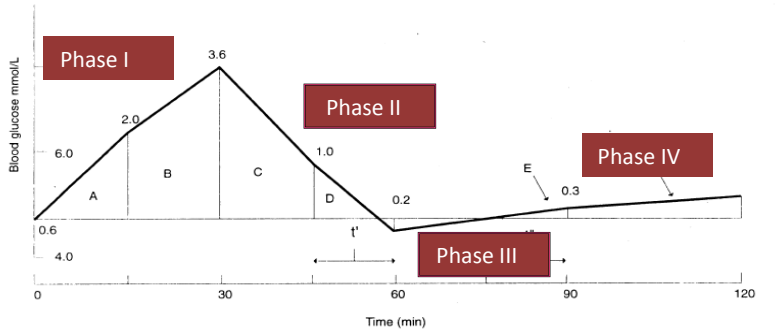


Figure 2: Example of a typical glycemic curve.

This nutritional property of polyols makes them suitable ingredients for nutritional solutions in food to fight against diabetes, obesity and cardiovascular diseases. Indeed, the consumption of food containing digestible sugars, such as glucose or sucrose, because of the high level of insulin secretion they induce, gives rise to very low glucose levels two hours after intake and induces a rapid return of the hunger feeling. Therefore, the recurrent intake of sugar may give rise to constant post-prandial hyperglycemia, which may result in insulin resistance and overeating. Moreover, it has been demonstrated that substances inducing sustained low hyperglycemia and a low post-prandial insulin peak tend to delay the return of the hunger feeling and are associated with lipogenesis inhibition.

The glycemic response following the intake of maltitol is both lower and more evenly distributed over time[4]. With its low insulinaemic response, incorporated in preparations such as chocolates, bread, biscuits, maltitol can thus be considered to be a food of choice for blood glucose control and improved hunger feeling management. Therefore, maltitol can be used for incorporation in food as part of a diet to prevent obesity and associated metabolic diseases.

Polyols are partners of the oral health prevention

Unlike sugars, polyols are non-cariogenic because they are not fermented by microorganisms in the oral cavity and dental plaque. Therefore, consumption of polyols does not result in production of acids in contact of the dental enamel. Recently, the European Food Safety Agency (EFSA) has authorized to claim that the use of a polyol (or a combination of polyols) in food products help to maintain the tooth mineralization by decreasing its demineralization[8]. This claim has been authorized thanks to the level of scientific proofs brought by the evaluation of the oral pH using the pH-telemetry method. This method has been developed by DrImfeld in the early 80's and has become the official reference method for evaluating the oral pH; it allows the dynamic measure of the pH in the dental plaque. Using this method, it has been possible to show that the consumption of a polyol, like maltitol, does not decrease the dental plaque pH under the critical value of 5.7 (figure 3). Moreover, the consumption of maltitol sugar-free chewing-gums favors the mineralization of the tooth enamel[9].

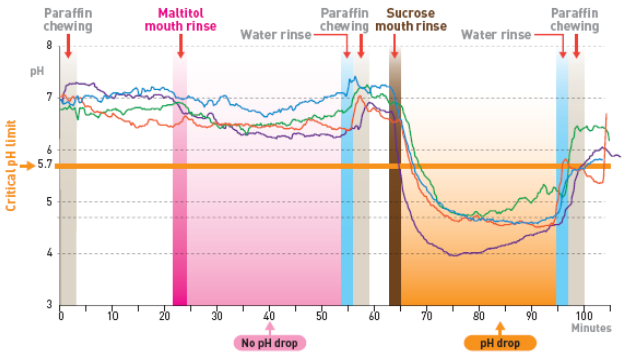


Figure 3: pH-telemetry curves during 30 minutes after a mouth rinse with maltitol solution (positive control: sucrose solution).

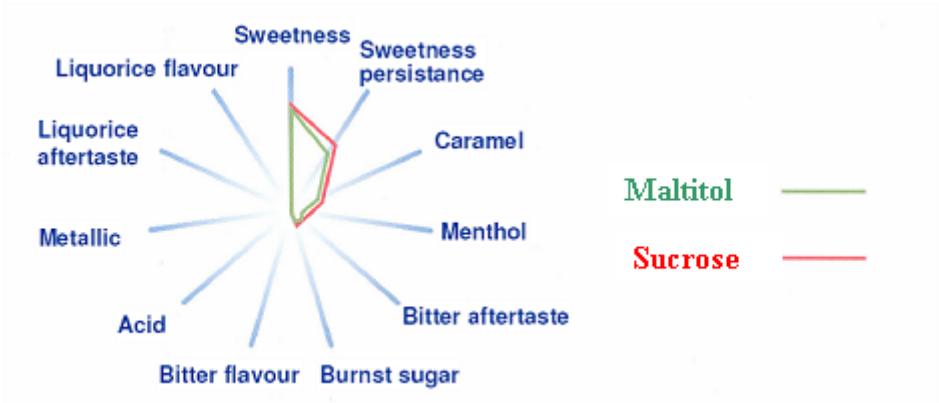
Indeed, beyond this value, the enamel may be demineralized, dissolved, which is the breaking point for the development of tooth decay. Successfully passing this test, a polyol like maltitol, in solution or in food matrix such as chewing-gum, is considered as “safe for teeth” by the Tooth Friendly International association. Such a product can thus harbor the “happy tooth” logo of the association.

Easy To Use, Familiar Sweetness of Sucrose – Possible with Maltitol

Flavour Release and Mouthfeel of Maltitol

Flavour release, mouthfeel attributes of maltitol is very similar to sugar as shown in figure 4. As far as sensory benefits are concerned, products made with maltitol have extraordinary flavour release and mouthfeel, and this is the reason it has become the benchmark ingredient for no added sugars chocolates and sugar-free chewing gums. Maltitol is therefore suitable for all those who wish to restrict their sugar intake and keep control of calories as well as blood glucose response while keeping the same level of indulgence and guilt-free satisfaction.

(a)



(b)

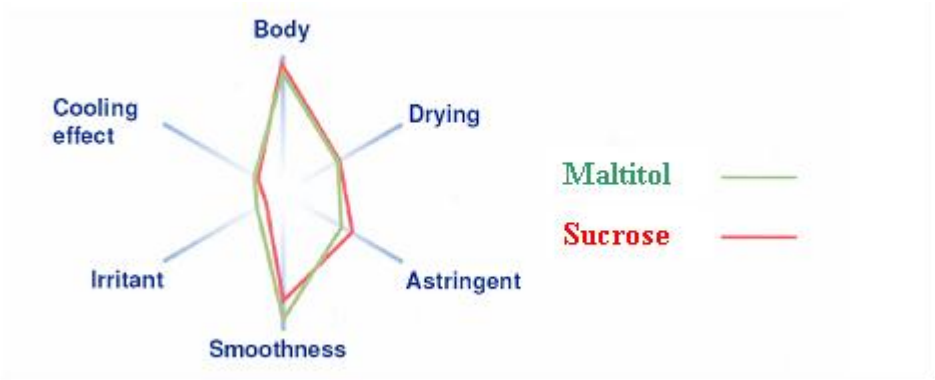


Figure 4: (a) Flavour and after taste attributes, (b) Mouthfeel attributes of Maltitol and sugar (sucrose)[10]

Technological Benefits

Other than taste profile, a sugar replacer must also meet the challenge of having similar physiochemical properties of sucrose. Since the molecular weight, solubility, melting point of maltitol is very similar to that of sucrose (Table 1), these attributes allow the manufacturer to utilize the same recipe without making any change in processing parameters and steps in manufacturing of the product.

Characteristics	Sugar (Sucrose)	Maltitol
Molecularweight	342	344
Sweetness	1.0	0.9
Energy (kcal/g)	4.0	2.4 (EU)
Solubility @ 22°C	67%	65%
Melting point (°C	168-170	144-152
Equilibrium relative humidity (ERH) for water uptake (20°C	84%	89%

Table 1. Comparison of maltitol and sugar (sucrose)[11]

All these flavor and technological attributes makes maltitol the perfect sugar alternative. So maltitol offers all the advantages of sucrose with the added freedom to innovate without compromising the health.

Expanding Health Portfolio in Food Using Polyols

Confectionery –

Sweet little Breaks The moment one thinks of confectioneries, all that one impulsively thinks of a product, that is laden with ample of sugars. Confectioneries are particularly popular amongst the younger lot, as they often associate them with reward. However, the rising incidence of dental caries and eventual premature loss of teeth, make the parent restrict children from overindulging in these sugary treats.This has created a demand for sugar-free confectionery, which is tooth friendly. Sugar free confectionery is also a great alternative for the weight watchers and diabetics who want to enjoy their sweets without worrying about calories or blood sugar fluctuations. All the more, food manufacturers can claim calorie reduction, glycemic control and protection against dental caries, as most of the polyols are backed with good clinical data. However, the manufacturer cannot claim for protection against dental caries if the confectionery has some fermentable ingredient or acid flavor.

A good quality sweet like a chewing gum, chocolate, hard candy can be created using any of the permitted polyols – sorbitol, mannitol, isomalt, lactitol, xylitol and maltitol. Sorbitol and mannitol are highly cooling and bring laxative

issues. Xylitol is as sweet as sugar but it has higher cooling effect as compared to sorbitol and mannitol. Isomalt and lactitol are less sweetener than sugar and necessitate the addition of intense sweetener to food formulation achieve the desired sweetness. The final choice rests on the sweetness, cooling effect, solubility and melting point of the polyol. In chocolate and chocolate-based desserts maltitol highlights the cocoa taste and intensity of top quality cocoas.

Baked Foods – Bridging the Gap between Convenience and Health

Amongst all food segments in India, baked foods has registered as having one of the highest potential for growth. Baked foods like breads, cakes, pastries, cookies, biscuits and other variants primarily fulfill the need for convenience. However, sweet baked goods like cakes, pastries, croissants, biscuits seamlessly fulfill the need for convenience and occasional indulgence. Sugars other than imparting sweetness have a significant role to play in baked foods. Sugars affect moistness, protein denaturation, and add bulk to the product. Therefore, like confectionery, the choice of sweetener depends for bakery depends on molecular weight, interaction with other food constituents and solubility in the food formulation. Maltitol matches sucrose in many physical and chemical properties; therefore it is simpler to replace sugar entirely with maltitol. For a baker who is always on the lookout for making an outstanding product, maltitol offers the right sweetness and accentuates the baked flavours. However, close attention must be paid to products which are extremely sweet, as the consumers are likely consuming more than a serving, which can lead to laxative effect.

Ice-creams and Frozen Dessert – Sweet Cool Indulgence

Frozen desserts and ice-creams are relished not only because of their sweetness, but also the heightened perception of flavor that accompanies the cooling sensation. In addition to sweetness, conventional sweeteners serve important functionality which includes freeze point depression, water immobilization, bulking agent and shape retention. Therefore, an ideal sugar replacer must be able to mimic sugar in functionality as well as sweetness. Depending on the final end product desired the sugar replacer must be selected accordingly. Maltitol fulfills all these prerequisites, offers the right sweetness which complement new flavours and also offer health.

Sweet Spreads – Making Our Favorite Accompaniment Healthy

Sweet spreads like, jams, marmalades, fruit spreads are the kind of accompaniments that can instantly perk up our toast in the morning. Although they are particular popular amongst the younger generation, adults too enjoy them. Considering the fact that the primary ingredient in these sweet spreads is sugar, they are generally off the menu for diabetics and health conscious consumers who are keen on cutting down on sugar. By simply creating healthier spreads by reducing sugar content, or adding more fruits one can expect the sugar-weary consumer to buy sweet spreads. Luckily with maltitol, one has the possibility of eliminating sugar entirely in these formulations and still retain the texture and experience the wonderful flavours.

Regulatory Hurdles

Needless to say, before launching the products in the market it is essential to look into the regulatory status of these ingredients in terms of applications and permissible dosage levels. Polyols have been approved in bakery, ice-creams, frozen desserts, sweet spreads, hard boiled confectioneries and chocolates; however one of the key areas which will benefit the industry as well as the consumer alike is to open up the regulation for Indian sweets. Although confectionery and desserts is a growing market, traditional Indian sweets continue to have a strong hold in the Indian culture. By opening up the regulation in this front, the industry will be in a position to provide more options to the health conscious consumers who would want to enjoy these sweets.

To Conclude

Sugar replacers like polyols have made it possible to introduce healthier food products. They are delicious and taste like a product made from sugar. However, the demand will not pick up unless the consumers are educated regarding the health benefits.

Food Safety - What needs to be done?

Dr. P.I. Suvrathan

The enactment of the Food Safety and Standards Act in 2006 signalled a transition from the sixty year old Prevention of Food Adulteration Act (PFA) which focussed on detection of food adulteration and punishment as the sole preventive measure.. In the meanwhile, the rest of the world had moved on to a more scientific approach to safety of food by development of standards through a process of risk assessment, and shifting the burden of food safety to the Food Business Operator. Surveillance and monitoring systems are now recognized to be more effective than 100% inspection in seeking out where food safety risks reside and directing appropriate enforcement measures. Even a country such as USA which allocates considerable resources for safety of food ,is not able to carry out inspection of more than 1% of the food that is produced in the country.

Food Safety and Standards Authority (FSSAI) was established in 2008 and Rules and Regulations have come into force from 2011 August. This signals the completion of the "consolidation" phase where the multiple erstwhile Acts / Orders have been integrated. Most of the states have notified appointment of the Food Safety Commissioner of the state but the pace of strengthening the food safety machinery and the staff for prosecution and adjudication is still patchy at best. It is now time for FSSAI to shift gears in its working by addressing the nitty-gritty of the new regulatory system it is mandated to establish, because the devil is in the details and can make or mar the achievement of the objectives of the Food Safety and Standards Act. This is the opportunity to put in place a food safety regulatory structure in India which is based on risk analysis, scientific, effective and driven by the stakeholders. What are the steps that should figure in the agenda of FSSAI to achieve the objectives of the Act?

The role and functions of the Chairperson and the Chief Executive Officer need to be clarified and possible conflicts avoided for the smooth functioning of the Authority. It was clearly the intention of the Act that the carefully selected Chairperson should drive the mission of FSSAI by providing the needed policy guidance and direction. The role of the CEO is that of implementing the decisions of the Authority and supervising its staff. The overriding responsibility of the Chairperson for the implementation of the Act needs to be spelt out either through a direction of the Government or an appropriate amendment of the Act. The unity of command and continuity envisaged in the Objects of the Act and accountability of the Chairperson can be ensured only through such an enabling measure. Otherwise, the effectiveness of FSSAI as a regulatory body will be stymied by conflict between these two high functionaries.

When millions of Food Business Operators (FBO) are in the unorganized sector, including street food vendors and food carts, it would be futile to impose centrally determined food standards through an army of inspecting personnel. This will only encourage corruption at lower levels, encourage non compliance and defeat the purpose of the Act. Keeping this in view, the Act has provided for a much simpler registration procedure for small FBOs and application of the basic requirements of hygiene and safety to be achieved through their training and hand holding by government and non government organizations.

Modern food safety regulation emphasizes certification by accredited agencies, training though a net work of public and private trainers and enabling the FBO to demonstrate her safety levels through simple, clearly defined standards. FSSAI should now incentivise setting up a network of training and certifying agencies across the country. Only then can the potential of food processing industry as a large scale creator of employment and skills, especially for women, be realised. It is estimated that nearly 80% of the personnel engaged in processing of food are women, pointing to the need for a shift to women-centred programmes in the field of food safety.

FSS Act places special emphasis on the need to involve industry, consumers and other stake holders in the massive task of food safety, rather than as a purely government sponsored, and inspection driven programme. It may be recalled that the first lady of USA had spearheaded a popular movement named "Move It", focussing on a healthier lifestyle, better eating habits and safer food, involving children, housewives and industry. FSSAI should take a similar initiative in building an alliance partnering consumers, NGOs, industry and others to spread the "Safe Food, Tasty Food" message to the millions in India's towns and villages.

The eight Scientific Panels and Scientific Committee set up by FSSAI include a good cross section of the scientific talent and expertise in India. However, FSSAI has not been able to make full use of these Panels in its work. There is also the risk of hounding out scientists from outside the Government on the specious ground that such scientists are not "independent". Scientific excellence and public interest are not the monopoly of government institutions alone. Science has to be regarded as an indivisible whole based on rigorous evidence. Developed countries have been using the scientific skills available from wherever they are, in the pursuit of their national interests. By removing all non government scientists from the Panels, FSSAI runs the risk of being downgraded into a regulator with doubtful scientific authority. Denying the opportunity to non government scientists to participate in its Scientific Panels will only cripple the scientific credibility of FSSAI and defeat the objectives of the Act.

FSSAI should put in place strong conflict of interest procedures to ensure that private interests are declared in the formulation of standards which should be based on wide consultation. It does not stand to reason that industry which has to implement the food standards and consumers who bear the brunt of food safety risks are not involved in the formulation of safety standards. Currently the formulation of food standards in FSSAI continues to be done through a secretive process with the stakeholders left out of the whole exercise till the final standards are ready for notification. It is then not surprising that when the actual standards are notified, industry and consumers rise in a chorus of protest at the impracticality and unscientific nature of the proposed standards. FSSAI has to put in place rigorous and transparent consultative mechanisms so that inputs from all stakeholders, including negative feedback, are obtained before the draft standards are developed.

Not many are aware that the current Chairperson of the international food standard setting agency, Codex Alimentarius, is India's nominee. Codex Alimentarius is the FAO-WHO sponsored body, with more than 130 members including India, which develops international food safety standards through rigorous risk analysis so that smoother trade in food items is encouraged and consumer safety is ensured. FSSAI should carry out a quick review of India's food standards so that they are compatible with international standards and our interests are protected. The Chairperson of Codex being on the staff of FSSAI gives us a unique opportunity to spearhead such an initiative. FSSAI should play an active role in the various committees of Codex, exchanging views with like-minded countries, identifying areas where international standards can be integrated with ours in the pursuit of fair trade and building alliances. India is not likely to get a similar window of opportunity in the foreseeable future.

The effectiveness of the Food Safety law is dependent on the upgradation of food testing laboratories both in the public and private sector. The new food law contains a critical provision for challenging the test results of public food testing laboratories before prosecution is launched. The present condition of most public food testing labs is deplorable and their test results are subject to wide and unexplained variation. Most of them neither follow rigorous protocols, ensure scientific sampling nor carry out reliable tests. What is required urgently is a coordinated programme of training, infrastructure building and accreditation of labs, particularly in the public sector, so that the regulatory functions of FSSAI and state food safety commissioners are not compromised. FSSAI also needs to design and establish a food safety surveillance network which will detect food safety threats in real time and take corrective action before they get out of hand.

Risk analysis is the task of evaluating the threats to food safety by disaggregating the components of the food manufacturing and distribution, identifying the risk factors and leading to corrective action. The large majority of Indian foods, especially traditional foods, are awaiting such a risk analysis process which will enable the consumer to make informed choices regarding the food she eats, the nutrition available from various foods, and the means to secure a balanced diet and a healthy life.

FSSAI should lay down industry friendly licensing systems so that the Authority is not bogged down by an avalanche of applications which it may not be able to handle.ble to handle. FSSAI's Scientific Panels /Committee whose primary role is risk assessment may now be actually doing risk management- the latter a function of the Food Authority. The overall functioning of FSSAI should be placed on a risk based framework, linking structures, operations, functions with networked institutions(engaged in research relevant to the Authority),public health institutions etc. capture the output from these centrally, and evaluate, detect issues and direct corrective action.

Correcting the gaps in the regulatory structure should be high on the priority of FSSAI. Products and issues such as nutraceuticals, regulation of health claims, upgradation of the standards of drinking water, alcohol etc await urgent attention of FSSAI. Draft regulations which are already available with FSSAI need to be put through a rigorous process of due diligence and public consultation before they are notified. The Food Safety and Standards act can

make an impact on the life of the common man only when food safety plans are prepared by each town and panchayat so that each citizen can expect reasonable standards of food safety.

For this to happen, FSSAI needs to equip itself with the required skills and capabilities and attract the best talent available within the country. Otherwise, FSSAI will find itself overtaken by the march of food technology and the expansion of industry. FSSAI needs to build alliances with the large number of top class scientific institutions which can function as Centres of Excellence assisting FSSAI in its regulatory role. The success of FSSAI will depend on its capability to work with other institutions and individuals which are also involved in the task of food safety so that scientific evidence, consumer concerns and technological inputs get evaluated and converted into appropriate regulatory policies.

(Dr. P.I. Suvrathan was the first Chairperson of the Food Safety and Safety Authority of India. He can be contacted at suvrathan@gmail.com)

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Research in Health & Nutrition

Fruit and Vegetable Juice Concentrate Studied for Benefits in Overweight Boys

Nutraceuticals World June 29, 2012

A new study published in the July issue of The Journal of Pediatrics showed that supplementation with an encapsulated fruit and vegetable juice concentrate (Juice Plus+® Orchard Blend and Garden Blend; NSA, LLC, Memphis, TN) was associated with an increase in serum beta-carotene concentrations, reduced abdominal adipose tissue and improved insulin resistance in overweight boys compared to the placebo group. The study results added to an existing body of research about the role of nutrition in promoting children's health.

This double-blind placebo-controlled study was conducted at the Nemours Children's Clinic Division of Pediatric Endocrinology and Metabolism in Jacksonville, FL, and was funded by the Nemours Research Program. It followed 30 age-matched boys between the ages of six and 10 years (nine lean and 21 overweight) for a six-month period. Randomized participants received either placebo or fruit and vegetable juice concentrate capsules in conjunction with nutrition and lifestyle counseling sessions at baseline and halfway (three months) with a registered research dietician.

Body composition and abdominal fat mass were determined using a dual-energy x-ray absorptiometry (DEXA) scan. The study found a significant increase in serum beta-carotene levels in both the lean (303% +/- 85%) and overweight (334% +/- 57%) participants who received the fruit and vegetable juice concentrate capsules. The fruit and vegetable juice concentrate capsule group also showed a decrease in abdominal fat mass and significantly reduced triglycerides among the overweight participants (P=.032), which may have played an important role in their improved insulin sensitivity. The changes were observed in the absence of weight loss in the overweight boys in both the placebo and active groups.

Despite public health recommendations such as the Healthy People 2010 Report by the Centers for Disease Control and Prevention and the U.S. Department of Health and Human Services and the latest Expert Panel on the Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents, few children meet recommended nutrition guidelines. The researchers behind this latest study said improvements seen in insulin resistance, triglyceride levels, and abdominal fat attenuation in the fruit and vegetable juice concentrate capsule group opened new avenues for future research and underscore the need to enhance intake of nutrition from fruits and vegetables in overweight boys.

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Low-Glycemic Index Diet Best For Weight-Loss Management

June 29, 2012 Food Product Design

BOSTON—A low-glycemic index diet that reduces refined carbohydrates may help maintain weight loss better than reducing fat, according to a new study published in the Journal of American Medical Association (JAMA) that challenges the notion that "a calorie is a calorie."

The findings revealed diets that reduce the surge in blood sugar after a meal—either low-glycemic index or very low-carbohydrate—may be preferable to a low-fat diet for those trying to achieve lasting weight loss. Results also showed the low-glycemic index diet had similar metabolic benefits to the very low-carb diet without negative effects of stress and inflammation as seen by participants consuming the very low-carb diet.

Researchers at the New Balance Foundation Obesity Prevention Center Boston Children's Hospital investigated three popular diets—low-carb, low-glycemic and low-fat—to see if certain diets might lead to metabolic changes that could make it harder for dieters to maintain weight loss.

For the study, 21 overweight and obese young adults aged 18 to 40 first had to lose 10% to 15% of their body weight, and after weight stabilization, completed all three of the following diets in random order, each for four

weeks at a time. The randomized crossover design allowed for rigorous observation of how each diet affected all participants, regardless of the order in which they were consumed. The low-fat diet derived 60% of its calories from carbohydrates, 20% from fat and 20% from protein. The low-glycemic index diet contained 40% carbohydrates, 40% fat and 20% protein. The low-carbohydrate diet contained 60% fat, 30% protein and 10% carbohydrates.

Each of the three diets fell within the normal healthy range of 10% to 35% of daily calories from protein. They found the low-glycemic load diet was more effective than conventional approaches at burning calories (and keeping energy expenditure) at a higher rate after weight loss. The very low-carbohydrate diet produced the greatest improvements in metabolism, but increased participants' cortisol levels, which can lead to insulin resistance and cardiovascular disease. The very low-carbohydrate diet also raised C-reactive protein levels, which may also increase risk of cardiovascular disease. The low-fat diet caused the greatest decrease in energy expenditure, an unhealthy lipid pattern and insulin resistance.

"In addition to the benefits noted in this study, we believe that low-glycemic index diets are easier to stick to on a day-to-day basis, compared to low-carb and low-fat diets, which many people find limiting," the researchers said. "Unlike low-fat and very low-carbohydrate diets, a low-glycemic index diet doesn't eliminate entire classes of food, likely making it easier to follow and more sustainable."

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Caffeine Helps Boost Muscle Strength in Elderly

July 2, 2012 Food Product Design

COVENTRY, United Kingdom—Elderly individuals who regularly consume caffeine are more likely to maintain muscle strength and reduce their risk of falls and injuries, according to new research presented at the Society for Experimental Biology meeting on June 30.

For adults in their prime, caffeine helps muscles to produce more force. But as we age, our muscles naturally change and become weaker. Sports scientists at Coventry University examined whether these age-related changes in muscle would alter the effect of caffeine.

The researchers isolated muscles from mice ranging in age from juvenile to elderly, then tested their performance before and after caffeine treatment. They looked at two different skeletal muscles, which are the muscles we can control voluntarily. The first was the diaphragm, a core muscle used for respiration; the second was a leg muscle called the extensor digitorum longus (EDL), used for locomotion.

They found caffeine continued to enhance muscle performance in two different muscles from mice, although it was less effective in older muscles. Caffeine's effect was smallest for juvenile muscles, suggesting caffeine may not have an enhancing effect in developing muscles.

"Despite a reduced effect in the elderly, caffeine may still provide performance-enhancing benefits." said lead author Jason Tallis said. "With the importance of maintaining a physically active lifestyle to preserve health and functional capacity, the performance-enhancing benefit of caffeine could prove beneficial in the aging population."

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Whey Protein More Effective for Developing Lean Muscle

June 29, 2012 Food Product Design

ARLINGTON, Va.—Whey protein, a complete protein providing one of the best sources of branched-chain amino acids, has been found to be more effective in developing lean muscle when compared with soy protein, according to new research presented recently at the American College of Sports Medicine (ACSM) Annual Meeting.

University of Connecticut researchers led the study, which was funded by the Dairy Research Institute. The researchers followed participants for nine months as they completed a resistance training program three times a week. They were given either 20 grams of whey protein concentrate, or soy isolate daily (at breakfast on non-training days or immediately following exercise).

After completing nine months of resistance training, all participants experienced increases in lean muscle mass. The gains for participants consuming whey protein (3.3 kg) were significantly greater than for participants consuming soy protein (1.8 kg) group, potentially due to the branched-chain amino acid content of the whey protein, the researchers said.

The study builds upon the growing research supporting the value of resistance training combined with whey protein supplementation in building lean muscle. Whey protein naturally contains leucine, a branched-chain amino acid (BCAA) that plays a significant role in muscle maintenance and repair. It cannot be manufactured by the body and must be obtained through foods.

“Protein is an essential nutrient that plays many important roles in American’s diets. Beyond building and repairing muscles it has been found to increase satiety and may combat age-related loss of muscle mass," said Keigan Park, Ph.D., director of nutrition research, Dairy Research Institute.

Whey protein also delivers these benefits with a fresh, neutral taste, which complements the intended flavor of a product and makes it an ideal ingredient, specifically for health-conscience consumers.

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Scientists Discover Link Between Tomato Ripening, Color, Taste

June 28, 2012 Food Product Design

DAVIS, Calif.—It’s hard to find that oh-so perfect red tomato packed with flavor; however, that all might change now that researchers have decoded a gene that contributes to the level of sugar, carbohydrates and carotenoids in tomatoes, according to a new study published in the journal Science. The findings have significant implications for the $2 billion U.S. tomato industry, which annually harvests more than 15 million tons of the fruit for processing and fresh-market sales.

Researchers at Boyce Thompson Institute for Plant Research (BTI) at Cornell University, USDA and the University of California at Davis revealed the gene that underlies the uniform ripening mutation. This gene also influences how tomato fruits ripen and is used by commercial breeders to create tomatoes that develop into perfectly red, store-ready fruit.

“This information about the gene responsible for the trait in wild and traditional varieties provides a strategy to recapture quality characteristics that had been unknowingly bred out of modern cultivated tomatoes," said Ann Powell, a biochemist in UC Davis’ Department of Plant Sciences and one of the lead authors of the study. “Now that we know that some of the qualities that people value in heirloom tomatoes can be made available in other types of tomatoes, farmers can have access to more varieties of tomatoes that produce well and also have desirable color and flavor traits," she said.

For decades, plant breeders in the tomato industry have selected varieties that are uniformly light green before they ripen, in order to produce tomatoes that can be harvested at the same time. However, this characteristic is accompanied by an unintended reduction in sugars that compromises the flavor of the fresh fruit and its desirability for processing.

The UC Davis researchers began studying the genes influencing tomato fruit development and ripening after spending two summers screening tomato plants for transcription factors that might play a role in both fruit color and quality. Transcription factors are proteins that regulate genes, or turn them on and off. These factors themselves are manufactured or expressed by genes. They were particularly interested in tomatoes they observed in the field that were unusually dark green before they ripened.

Partnering with researchers at Cornell University and in Spain, who were mapping regions of the tomato genome, the scientists discovered two transcription factors, called GLK1 and GLK2, that control the development of chloroplasts. Chloroplasts are the structures in the plant cells that enable plants to photosynthesize, converting the energy of sunlight into sugars and other compounds that influence flavor and color.

The researchers scoured a collection of mutant and wild species of tomatoes at UC Davis established at UC Davis by the late Professor Charles Rick beginning in the 1950s. They discovered that dark green tomatoes that naturally express GLK2 produced ripe fruit with increased levels of sugars or soluble solids, important for processing tomatoes, as well as higher levels of the health-promoting compound lycopene.

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Babies of Obese Moms Have Lower Iron Levels

July 10, 2012Food Product Design

BOSTON—Babies born to obese mothers have lower iron levels at birth, which can result in greater risk for delays in motor and cognitive development, according to a new study published in the *Journal of Perinatology*.

“The chronic low-grade inflammation that can result from being obese triggers an abnormal immune response, increasing production of proteins that increase hepcidin levels," said Maria Carlota Dao, first author and a doctoral student in the Nutritional Immunology Laboratory at the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University (USDA HNRCA).

For the study, researcher enrolled 15 obese pregnant women with body mass index (BMI) greater than 30 and 15 healthy weight pregnant women with BMIs between 20 and 25 as a control group. Maternal blood draws took place during the second trimester of pregnancy and newborn iron status was measured in cord blood. The researchers found that being born to an obese mother with elevated hepcidin levels was associated with lower iron status at birth.

Obese adults are known to produce higher levels of hepcidin compared to healthy weight adults, and the researchers suggest that overproduction of the hormone interferes with the transfer of iron from mother to infant. Because iron plays a crucial role in the formation of the central nervous system, children born with iron deficiency are at a greater risk for delays in motor and cognitive development.

"During pregnancy, women should try to eat a varied, healthy diet while taking the standard prenatal vitamins recommended by their doctors. Weight gain goals should be based on a woman's BMI prior to becoming pregnant. In 2009, the Institute of Medicine (IOM) issued new guidelines on weight gain during pregnancy," the researchers added.

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Dietary Fiber Boosts Good Gut Bacteria

July 5, 2012Food Product Design

URBANA, Ill.— Dietary fiber supports good gut bacteria growth that can support a healthy gastrointestinal tract as well as affect a person’s susceptibility to conditions as varied as type 2 diabetes, obesity, inflammatory bowel disease, colon cancer, and autoimmune disorders such as rheumatoid arthritis, according to a new study published in the *Journal of Nutrition*.

Researchers at the University of Illinois Department of Animal Sciences recruited 20 men with an average fiber intake of 14 grams a day. They were then given food bars as supplements to their diet. Participants were randomly assigned into three groups. The control group received bars that contained no fiber; a second group ate bars that contained 21 grams of polydextrose, which is a common fiber food additive; and a third group received bars with 21 grams of soluble corn fiber.

On days 16-21, fecal samples were collected from the participants, and researchers used the microbial DNA they obtained to identify which bacteria were present. DNA was then subjected to 454 pyrosequencing, a “fingerprinting" technique that provides a snapshot of all the bacterial types present.

Both types of fiber affected the abundance of bacteria at the phyla, genus and species level. When soluble corn fiber was consumed, *Lactobacillus*, often used as a probiotic for its beneficial effects on the gut, increased. *Faecalibacterium* populations rose in the groups consuming both types of fiber.

The researchers said the shifts in bacteria seen in this study—which occurred when more and differing types of fiber were consumed—were the opposite of what you would find in a person who has poor gastrointestinal health. That leads them to believe that there are new possibilities for using pre- and probiotics to promote intestinal health.

“For example, one type of bacteria that thrived as a result of the types of fiber fed in this study is inherently anti-inflammatory, and their growth could be stimulated by using prebiotics, foods that promote the bacteria’s growth, or probiotics, foods that contain the live microorganism," they said

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Coriander Boosts Bread’s Nutrient Profile

July 24, 2012Food Product Design

KOLKATA, India—Boosting the nutrient content of common white bread by fortifying it with coriander leaf powder enhanced sensory and bakery characteristics, as well as shelf life, according to a study published in the journal *Food Science and Biotechnology*.

Researchers at the Department of Food Technology and Biochemical Engineering at Jadavpur University evaluated the sensory, textural and baking characteristic impacts, the staling properties and antioxidant level improvement of wheat flour supplemented with 1.0%, 3.0%, 5.0% and 7.0% (w/w) of coriander leaf powder.

Results show supplementation with coriander leaf powder improved the crumb moisture content with only a little increase in crumb firmness. A substantial improvement in sensory characteristics was observed with the supplemented breads. A sharp increase in antioxidant content was an important beneficial fortification effect observed in the fortified breads. Coriander leaf content between 3.0% and 5.0% was found to be the optimum supplementation level that offered the best compromise for highest acceptability of the fortified breads.

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Low Vitamin D, Obesity Increase Diabetes Risk

July 20, 2012Food Product Design

PHILADELPHIA—The combination of abdominal obesity and vitamin D deficiency may put people at even greater risk of insulin resistance than either factor alone, according to a new study published in the journal *Diabetes Care*.

Researchers at Drexel University’s School of Public Health analyzed data on serum vitamin D levels and indicators of insulin resistance and diabetes from 5,806 respondents to a major national health survey, the National Health and Nutrition Examination Survey (NHANES). This was the first study of the association between vitamin D and diabetes risk for obese patients using a large, nationally representative sample of adults. The survey reported data from individuals at a single point in time and was therefore unable to determine whether there is a cause-and-effect relationship among vitamin D, obesity and insulin resistance.

They found obese individuals who had healthy levels of vitamin D had insulin resistance almost 20 times more often than the overall study population. But in obese individuals whose serum vitamin D was low, insulin resistance was much higher—about 32 times more common than the average.

“Vitamin D insufficiency and obesity are individual risk factors for insulin resistance and diabetes," the researchers said. “Our results suggest that the combination of these two factors increases the odds of insulin resistance to an even greater degree than would have been expected based on their individual contributions."

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Diet Rich in Vitamin E May Lower Liver Cancer Risk

July 20, 2012Food Product Design

SHANGHAI—Individuals who consume a diet rich in foods containing vitamin E may reduce their risk of liver cancer, according to a new study published in the *Journal of the National Cancer Institute*.

Researchers at the Shanghai Jiaotong University School of Medicine, Vanderbilt-Ingram Cancer Center and the National Cancer Institute evaluated vitamin intake from diet and supplements and risk of liver cancer in 132,837 women and men from China who were recruited into the Shanghai Women’s Health Study from 1997 to 2000 or the Shanghai Men’s Health Study from 2002 to 2006, two population-based cohort studies jointly conducted by the Shanghai Cancer Institute and Vanderbilt University.

Using validated food-frequency questionnaires, the researchers conducted in-person interviews to gather data on study participants’ dietary habits. Participants were asked how often they ate some of the most commonly consumed foods in urban Shanghai and whether they took vitamin supplements.

More than 250 participants (118 women and 149 men) developed liver cancer during an average of 10.9 (Shanghai Women’s Health Study) or 5.5 (Shanghai Men’s Health Study) years of follow-up. Dietary vitamin E intake was inversely associated with liver cancer risk, as was vitamin E supplement use. This association was consistent among participants with and without self-reported liver disease or a family history of liver cancer.

“We found a clear, inverse dose-response relation between vitamin E intake and liver cancer risk," the researchers said, noting a small difference between men and women in the risk estimate, which is likely attributable to fewer liver cancer cases having occurred among male participants due to the shorter follow-up period.

Conversely, participants who had the highest vitamin C intake from supplements and who had a family history of liver cancer or self-reported liver disease were more likely to develop liver cancer. There was no link to liver cancer among participants who had the highest levels of vitamin C or other vitamins from food.

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Bananas Boost Energy During Intense Exercise

July 18, 2012Food Product Design

BOONE, N.C.—Long a favorite source of energy for endurance and recreational athletes, nutrient-rich bananas may actually provide more energy during exercise compared to typical carbohydrate-rich sports drinks, according to a new study published in the journal *PLoS ONE*.

Researchers at Appalachian State University’s Human Performance conducted a study to determine whether bananas or carbohydrate sports drinks are more beneficial when consumed during intense cycling.

For the study, trained cyclists consumed either a cup of carbohydrate drink or half a banana every 15 minutes during a 75-kilometer simulated road race lasting 2.5 to 3 hours. Blood samples taken from the cyclists before and after the exercise were analyzed at the NCRC Metabolomics Laboratory for more than 100 metabolites. They found bananas provided the cyclists with antioxidants not found in sports drinks, as well as a greater nutritional boost, including fiber, potassium and vitamin B6. In addition, bananas have a healthier blend of sugars than sports drinks.

“This type of research shows that you can have healthier carbohydrate sources before and after exercise that will support athletic performance just as well as a sports drink," the researchers said.

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Maternal Iodine Supplementation Linked to Congenital Hypothyroidism in Newborns

Science Daily (July 26, 2012) — Congenital hypothyroidism is thyroid hormone deficiency at birth that, if left untreated, can lead to neurocognitive impairments in infants and children. Although the World Health Organization recommends 200-300 µg of iodine daily during pregnancy for normal fetal thyroid hormone production and neurocognitive development, the US Institute of Medicine considers 1,100 µg to be the safe upper limit for daily ingestion.

A case series scheduled for publication in *The Journal of Pediatrics* describes three infants who developed congenital hypothyroidism as a result of excess maternal iodine supplementation.

Kara Connelly, MD, and colleagues from Oregon Health & Science University, Doernbecher Children's Hospital, Boston University School of Medicine, State of Oregon Public Health Laboratory, and Randall Children's Hospital at Legacy Emanuel describe three infants with congenital hypothyroidism whose mothers had taken 12.5 mg of iodine daily, 11 times more than the safe upper limit, while pregnant and/or breastfeeding. Iodine is transferred from the mother to the infant through the placenta or breast milk. The three infants had blood iodine levels 10 times higher than healthy control infants (measured from newborn screening filter paper).

Excess iodine causes the thyroid to temporarily decrease function to protect against hyperthyroidism (Wolff-Chaikoff effect). Adults and older children are able to "escape" from this effect after several days of excess iodine to avoid hypothyroidism. However, the immature thyroid glands of fetuses and newborns have not developed this protective effect and are more susceptible to iodine-induced hypothyroidism. Although infants recover normal thyroid function after acute iodine exposure (e.g., a few days of topical iodine application), continuous excessive iodine exposure to the fetal and neonatal thyroid gland may cause long-term harmful effects on thyroid function.

Sources of iodine include nutritional supplements, prenatal vitamins, and seaweed (kelp). According to Dr. Connelly, "The use of iodine-containing supplements in pregnancy and while breastfeeding is recommended in the United States. However, these cases demonstrate the potential hazard of exceeding the safe upper limit for daily ingestion." Excess iodine ingestion from supplementation is often unrecognized because it is not routine practice to ask mothers of infants with congenital hypothyroidism about nutritional supplements taken during pregnancy. Pregnant or breastfeeding women should discuss the safe dosages of nutritional supplements with their doctors prior to including them in their daily regimen.

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Is There Such a Thing as Eating Too Many Fruits and Vegetables?

Science Daily (July 24, 2012)

It may make you scratch your head, but in fact it is possible to overeat healthy foods, according to Loyola University Health System registered dietitian Brooke Schantz.

"While fruits are nutritious, too much of even a healthy food can lead to weight gain," Schantz said. "The key is to remember to control the portion sizes of the foods you consume."

Schantz reported that overeating healthy foods is easy to do, but the same rules apply to healthy food as junk food. Weight fluctuates based on a basic concept -- energy in versus energy out. If your total caloric intake is higher than the energy you burn off in a day, you will gain weight. If it is lower, you will lose weight.

"I have had many patients tell me that they don't know why they are not losing weight," Schantz said. "Then they report that they eat fruit all day long. They are almost always shocked when I advise them to watch the quantity of food they eat even if it is healthy."

Schantz said that one exception applies. Nonstarchy vegetables are difficult to overeat unless they are accompanied by unnecessary calories from sauces, cheeses and butter. This is due to the high water and fiber content of these vegetables coupled with the stretching capacity of the stomach. The vegetables she suggested limiting are those that are high in starch, such as peas, corn and potatoes. Foods that are labeled as fat-free or low-fat are another area of concern.

"People tend to give themselves the freedom to overeat 'healthy' foods," Schantz said. "While the label might say that a food or beverage is low-fat or fat-free, watch the quantity you consume and refrain from eating an excessive amount. Foods that carry these health claims may be high in sugar and calories."

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Increased Recommended Dietary Vitamin C Could Help Reduce Heart Disease, Stroke, Cancer

Science Daily (July 16, 2012)

The recommended dietary allowance, or RDA, of vitamin C is less than half what it should be, scientists argue in a recent report, because medical experts insist on evaluating this natural, but critical nutrient in the same way they do pharmaceutical drugs and reach faulty conclusions as a result.

The researchers, in *Critical Reviews in Food Science and Nutrition*, say there's compelling evidence that the RDA of vitamin C should be raised to 200 milligrams per day for adults, up from its current levels in the United States of 75 milligrams for women and 90 for men.

Rather than just prevent the vitamin C deficiency disease of scurvy, they say, it's appropriate to seek optimum levels that will saturate cells and tissues, pose no risk, and may have significant effects on public health at almost no expense -- about a penny a day if taken as a dietary supplement.

"It's time to bring some common sense to this issue, look at the totality of the scientific evidence, and go beyond some clinical trials that are inherently flawed," said Balz Frei, professor and director of the Linus Pauling Institute at Oregon State University, and one of the world's leading experts on the role of vitamin C in optimum health.

"Significant numbers of people in the U.S. and around the world are deficient in vitamin C, and there's growing evidence that more of this vitamin could help prevent chronic disease," Frei said. "The way clinical researchers study micronutrients right now, with the same type of so-called 'phase three randomized placebo-controlled trials' used to test pharmaceutical drugs, almost ensures they will find no beneficial effect. We need to get past that."

Unlike testing the safety or function of a prescription drug, the researchers said, such trials are ill suited to demonstrate the disease prevention capabilities of substances that are already present in the human body and required for normal metabolism. Some benefits of micronutrients in lowering chronic disease risk also show up only after many years or even decades of optimal consumption of vitamin C -- a factor often not captured in shorter-term clinical studies.

A wider body of metabolic, pharmacokinetic, laboratory and demographic studies suggests just the opposite, that higher levels of vitamin C could help reduce the chronic diseases that today kill most people in the developed world -- heart disease, stroke, cancer, and the underlying issues that lead to them, such as high blood pressure, chronic inflammation, poor immune response and atherosclerosis.

"We believe solid research shows the RDA should be increased," Frei said. "And the benefit-to-risk ratio is very high. A 200 milligram intake of vitamin C on a daily basis poses absolutely no risk, but there is strong evidence it would provide multiple, substantial health benefits."

An excellent diet with the recommended five to nine daily servings of fruits and raw or steam-cooked vegetables, together with a six-ounce glass of orange juice, could provide 200 milligrams of vitamin C a day. But most Americans and people around the world do not have an excellent diet.

Even at the current low RDAs, various studies in the U.S. and Canada have found that about a quarter to a third of people are marginally deficient in vitamin C, and up to 20 percent in some populations are severely deficient -- including college students, who often have less-than-perfect diets. Smokers and older adults are also at significant risk.

Even marginal deficiency can lead to malaise, fatigue, and lethargy, researchers note. Healthier levels of vitamin C can enhance immune function, reduce inflammatory conditions such as atherosclerosis, and significantly lower blood pressure.

• A recent analysis of 29 human studies concluded that daily supplements of 500 milligrams of vitamin C significantly reduced blood pressure, both systolic and diastolic. High blood pressure is a major risk factor for heart disease and stroke, and directly attributes to an estimated 400,000 deaths annually in the U.S.

• A study in Europe of almost 20,000 men and women found that mortality from cardiovascular disease was 60 percent lower when comparing the blood plasma concentration of vitamin C in the highest 20 percent of people to the lowest 20 percent.

• Another research effort found that men with the lowest serum vitamin C levels had a 62 percent higher risk of cancer-related death after a 12-16 year period, compared to those with the highest vitamin C levels.

Laboratory studies with animals -- which may be more accurate than human studies because they can be done in controlled conditions and with animals of identical genetic makeup -- can document reasons that could explain all of these findings, Frei said.

Critics have suggested that some of these differences are simply due to better overall diet, not vitamin C levels, but the scientists noted in this report that some health benefits correlate even more strongly to vitamin C plasma levels than fruit and vegetable consumption.

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Weight Loss Resulting from a Low-Fat Diet May Help Eliminate Menopausal Symptoms

Science Daily (July 11, 2012)

Weight loss that occurs in conjunction with a low-fat, high fruit and vegetable diet may help to reduce or eliminate hot flashes and night sweats associated with menopause, according to a Kaiser Permanente Division of Research study that appears in the current issue of *Menopause*.

This Women's Health Initiative study of 17,473 women found that women on a diet low in fat and high in whole grains, fruit and vegetables, who had menopausal symptoms, who were not taking hormone replacement therapy, and who lost weight (10 or more pounds or 10 or more percent of their baseline body weight), were more likely to reduce or eliminate hot flashes and night sweats after one year, compared to those in a control group who maintained their weight.

Many women experience hot flashes at some point before or after menopause, when their estrogen levels are declining, explain the researchers.

"While the mechanism is not completely understood, hot flashes and night sweats are thought to be caused by a complex interaction that involves fluctuating hormone levels, the hypothalamus region of the brain that regulates body temperature, brain chemicals and receptors, and the body's blood vessels and sweat glands," said Candyce Kroenke, ScD, MPH, a research scientist with the Kaiser Permanente Northern California Division of Research and lead author of the study.

Although previous research has shown that high body weight and weight gain are associated with hot flashes and night sweats associated with menopause, this study is the among the first -- and the largest to date -- to analyze whether weight loss on a diet designed to reduce fat and increase whole grains, fruit and vegetable intake might ameliorate symptoms. It is also among the first to examine the influence of a dietary change on symptoms that include hot flashes and night sweats, said Kroenke.

"Since most women tend to gain weight with age, weight loss or weight gain prevention may offer a viable strategy to help eliminate hot flashes and night sweats associated with menopause," said Bette Caan, DrPH, a research scientist with the Kaiser Permanente Northern California Division of Research and the senior author of the study.

She explained that greater body fat provides insulation that may hinder heat loss, and hot flashes and night sweats provide a way to dissipate that heat.

"Weight loss, especially loss of fat mass but not lean mass, might also help alleviate hot flashes and night sweats," added Kroenke.

The investigators emphasize that further research is needed to better understand the relationship between diet, weight and hot flash/night sweat symptoms. They explain that the beneficial impact of a healthy diet alone (regardless of weight change) may also help ameliorate symptoms.

This study follows a related study published in March in the *Journal of Clinical Oncology* in which Kaiser Permanente researchers found that preventing weight gain after a breast cancer diagnosis may offer a viable intervention for relief of hot flashes. The researchers noted that intentional weight loss in breast cancer survivors requires further study.

The Women's Health Initiative Dietary Modification trial enrolled a diverse group of 48,835 post-menopausal women between 1993 and 1998 at 40 United States clinical centers to evaluate the effects of a low-fat dietary pattern on heart disease, breast and colorectal cancer, and fracture in post-menopausal women. The dietary intervention was aimed at reducing fat intake and increasing fruit, vegetable and whole grain intake. Although weight loss was not a goal, participants assigned to the intervention group lost on average 4.5 pounds between baseline and year one, compared to the control group.

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How a Protein Meal Tells Your Brain You're Full

Science Daily (July 5, 2012)

Feeling full involves more than just the uncomfortable sensation that your waistband is getting tight. Investigators reporting online on July 5th in the Cell Press journal *Cell* have now mapped out the signals that travel between your gut and your brain to generate the feeling of satiety after eating a protein-rich meal. Understanding this back and forth loop between the brain and gut may pave the way for future approaches in the treatment and/or prevention of obesity.

Food intake can be modulated through mu-opioid receptors (MORs, which also bind morphine) on nerves found in the walls of the portal vein, the major blood vessel that drains blood from the gut. Specifically, stimulating the receptors enhances food intake, while blocking them suppresses intake. Investigators have now found that peptides, the products of digested dietary proteins, block MORs, curbing appetite. The peptides send signals to the brain that are then transmitted back to the gut to stimulate the intestine to release glucose, suppressing the desire to eat.

Mice that were genetically engineered to lack MORs did not carry out this release of glucose, nor did they show signs of 'feeling full', after eating high-protein foods. Giving them MOR stimulators or inhibitors did not affect their food intake, unlike normal mice.

Because MORs are also present in the neurons lining the walls of the portal vein in humans, the mechanisms uncovered here may also take place in people.

"These findings explain the satiety effect of dietary protein, which is a long-known but unexplained phenomenon," says senior author Dr. Gilles Mithieux of the Université de Lyon, in France. "They provide a novel understanding of the control of food intake and of hunger sensations, which may offer novel approaches to treat obesity in the future," he adds.

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Higher but Not Lower Doses of Vitamin D Are Effective in Fracture Risk Reduction in Older Adults, Study Finds

Science Daily (July 5, 2012)

Based on the results of a pooled analysis of 11 unrelated randomized clinical trials investigating vitamin D supplementation and fracture risk in more than 31,000 older adults, Bess Dawson-Hughes, MD, director of the Bone Metabolism Laboratory at the Jean Mayer USDA Human Nutrition Research Center on Aging (USDA HNRCA) at Tufts University, says higher doses of Vitamin D may be the most beneficial in reducing bone fractures in this age group.

As part of the study, published today in *The New England Journal of Medicine,* Dawson-Hughes and colleagues divided the subjects into quartiles ranging from 0 to 2,000 International Units (IUs) of daily vitamin D intake. In the top quartile, there was a 30% reduction in hip fracture risk and a 14% reduced risk of fracturing other bones, compared to the control groups.

"Taking between 800 IUs and 2,000 IUs of vitamin D per day significantly reduced the risk of most fractures, including hip, wrist and forearm in both men and women age 65 and older," said Dawson-Hughes, the study's senior author. "Importantly, we saw there was no benefit to taking Vitamin D supplements in doses below 800 IUs per day for fracture prevention."

Dawson-Hughes and colleagues analyzed each participant's vitamin D supplementation within and independent of the study protocol, controlling for age, vitamin D blood levels at baseline, additional calcium supplementation and whether the person lived independently or under medical care.

"Evaluation of individual-level data is the gold-standard of meta-analysis," said lead author Heike Bischoff-Ferrari, MD, D.Ph., director of the Centre on Aging and Mobility at the University of Zurich and Waid City Hospital and a visiting scientist in the Bone Metabolism Laboratory at the USDA HNRCA. "Our results make a compelling contribution to the existing data on Vitamin D and fracture risk in men and women age 65 and older, whose vulnerability to bone density loss and osteoporosis leave them prone to fractures resulting from thinning bones."

The current Dietary Reference Intake (DRI) for vitamin D in older adults set by the Institute of Medicine (IOM) is a minimum of 600 IUs per day for adults between 51 and 70 years-old and 800 IUs in adults over 70.

"Vitamin D supplementation is an efficient intervention for a costly injury that affects thousands of older adults each year," said Dawson-Hughes, who is also a professor at Tufts University School of Medicine. "The average recovery is long and painful and deeply impacts quality of life. After a fracture, older patients may only regain partial mobility, resulting in a loss of independence that is personally demoralizing and that can place added stress on family members and caregivers"

Financially, Vitamin D supplements cost pennies a day, Dawson-Hughes said, whereas the American Academy of Orthopaedic Surgeons estimated the cost of treating a hip fracture was $26,912 in 2007.

Dawson-Hughes adds that older adults, unless they are exposed to bright, year-round sunlight, require supplementation to meet their vitamin D needs. Typically, adults consume 150 IUs per day from food sources such as tuna or salmon or fortified milk. On average, multivitamins contain 400 IUs of vitamin D and there are individual vitamin D supplements with 400, 800 or 1,000 IUs. While vitamin D toxicity is rare, the IOM suggests capping intake at 4,000 IUs per day.

Dawson-Hughes said the results of the current study would be strengthened by large interventional trials investigating the impact of vitamin D supplementation on fracture risk. She and the authors also call for further investigation of the impact of combining calcium supplementation with high doses of vitamin D, as their data was inconclusive.

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Cutting Calories Might Help You Live Longer, but Not Without Increased Physical Activity

Science Daily (July 2, 2012)

Fruit flies on dietary restriction (DR) need to be physically active in order to get the lifespan extending benefits that come from their Spartan diet. If the same axiom holds true in humans, those practicing caloric restriction in hopes of living longer need to make sure they eat enough to avoid fatigue.

According to research at the Buck Institute, flies on DR shift their metabolism toward increasing fatty acid synthesis and breakdown, specifically in muscle tissue. "Dietary restriction is known to enhance spontaneous movement in a variety of species including primates, however this is the first examination of whether enhanced physical activity is necessary for its beneficial effects," said Buck faculty Pankaj Kapahi, PhD, who runs the lab where the research took place. "This study establishes a link between DR-mediated metabolic activity in muscle, increased movement and the benefits derived from restricting nutrients," he said, adding that flies on DR who could not move or had inhibited fat metabolism in their muscle did not exhibit an extended lifespan. "Our work argues that simply restricting nutrients without physical activity may not be beneficial in humans," said Kapahi.

The research is published in the July 3, 2012 edition of *Cell Metabolism*.

The research also points to a potential target that could yield a drug that mimics the beneficial effects of DR. Lead author, Subhash D. Katewa, PhD, Buck Institute staff scientist, said flies genetically engineered to overexpress the circulating peptide AKH (the fly equivalent of glucagon in mammals) showed increased fat metabolism, spontaneous activity and extended lifespan even though their diet was unrestricted. AKH plays a critical role in glucose and lipid metabolism. "Our data suggests that DR may induce changes in muscle similar to those observed under endurance exercise and that molecules like AKH could serve as potential mimetics for DR that enhance activity and healthspan," said Katewa.

"A better understanding of the dynamics of fat metabolism is needed in order to clarify its role in aging and disease," Katewa said. "These current results suggest that enhanced fat metabolism could help slow aging and the onset of age-related disease."

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What Is The Right Amount Of Fibre For Kids?

Medical News Today 31 Jul 2012

Although scientists have previously determined the recommended daily amounts of certain nutrients, like calcium and vitamin D, they have yet to determine the appropriate numbers for some, such as fibre.

Casey Weber, doctoral student in human nutrition from Mound City and researcher at Kansas State University, is hoping to better the understanding of a child's recommended daily allowance of fibre. He recently finished his first of two studies observing children's dietary fibre.

"Fibre essentially is anything that is not digested or provides a functional benefit, but there's no easy way to classify what that fibre is," Weber explained. "While findings exist for adults, there isn't a lot of information about children and the effects of their fibre intake."

The way a person's body ferments fibre after it is taken in, whether it be a child or adult, is extremely important. Higher levels of fermentation could mean short-chain fatty acid production, possibly preventing colon cancer, according to Weber. These products of fermentation also supply a source of fuel for colonocytes and beneficial effects in regards to blood lipids (linked to cardiovascular disease).

Children, starting age 1, have a dietary reference intake (DRI) - which tells parents how much of a particular nutrient their kids should eat. Weber said that the intake amount for fibre is an adequate intake amount (AI) because there is not enough existing information about fibre intake to inform people of a specific recommended daily allowance (RDA).

Weber believes there has not been enough research with appropriate context to support the listed daily fibre adequate intake amount. For example, children may have a daily allowance of 19 grams of fibre, but there is little research to support that amount. Fortunately, there have been improvements in recent technology with new ways of measuring variables that could not be measured in populations of young children in the past.

He explained: "I want to determine if more information should be available before we really push for this recommended number. Most people view the recommended intakes as black-and-white. They think it is the concrete amount needed, but that isn't necessarily the case. I'm interested in how fibre interacts with the large intestines of children. The interactions are a potential measure of other beneficial mechanisms that are taking place."

In the expert's first study, which opened the door to further investigations, he was working with the university's Hoeflin Stone House Early Childhood Education Centre. He spent 5 weeks measuring the fibre fermentation levels of 20 healthy kids after they ate a fibre-dense breakfast cereal.

A breath hydrogen test was used to measure the fibre, which indicated the level of fermentation by bacteria in the colon. As the fibre goes through the large intestine, it is fermented into a hydrogen and methane gas. This was measurable through the breath hydrogen test after the kids ate different amounts of the fibre cereal."The fermentation is measured because it's an indicator of suggested healthy metabolism that is happening in the large intestine," said Weber. "We can measure it without actually looking inside."

According to Weber, the children were given 25, 50, and 75 percent of the recommended daily amount of fibre in order to be relative to the daily recommendations for kids. This would determine if each child ferments fibre in the same way.

Weber and his team hypothesized that as the fibre increased the production of methane and hydrogen would also increase. The results did not show a significant difference. He explained, "Literature has shown some individuals do not produce any gas with any level of fibre. In-vitro and adult studies indicate that more gas will be produced with increased food supply. There is much to learn about the way fibre is handled in growing children."

This study also illustrated a few challenges faced when researching the outcomes of food intake on health in children, such as increased selectiveness in food choices, he pointed out. This shows the difficulty in getting children to eat more fibre.

He said: "Adults and children have the same recommendation of fibre per calorie consumed. According to the recommendations, a 5-year-old can need up to 25 grams of fibre. Parents and caregivers are often surprised that the amount we encourage their children to eat is typically only 50 percent of the daily recommendation. Our goal is to provide a science-based fibre recommendation to give children the tools for a healthy start."

He added that while preparing for and conducting this first study, the biggest surprise to him was the realization of how vague the scientific world's knowledge is of dietary fibre in kids.
"We're finding out how many doors are closed that we need to open," he said.

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Raisins As Good As Sports Chews For Workout Boost

Medical News Today 31 Jul 2012

Eating raisins could provide the same workout boost as sports chews, according to an article in the Journal of The International Society of Sports Nutrition. Researchers from California-Davis University discovered that raisins are a cheap, natural source that provide an alternative to energy bars.

In order to evaluate the impact of natural supplements compared with carbohydrate supplements on endurance running performance, the researchers performed three randomized trials on runners, with a 7-day break between trials.The participants were assigned to consume raisins, chews or water as a supplement.

In the first trial, they depleted their glycogen stores in an 80-minute (75%VO2max) run followed by a 5k time-trial. The trial was repeated twice with a 7-day interval in between trials.The results revealed that those who consumed raisins or sports chews were on average 1 minute faster in the 5k run compared with those who drank just water. Researchers also found that raisins and sports chews promoted higher carbohydrate oxidation than water.

James Painter, Ph.D., R.D., and nutrition research advisor for the California Raisin Marketing Board, concluded: "Raisins are a great alternative to sport chews as they also provide fiber and micronutrients, such as potassium and iron, and they do not have any added sugar, artificial flavor or colors. As an added bonus, raisins are the most economical dried fruit according to the United States Department of Agriculture, so they are cost effective and convenient for use during exercise."

What are raisins?

A raisin is a dried grape which can be consumed raw or used in cooking or brewing. In Canada, UK, Ireland, and

Australasia, a**sultana** is a large dried white grape while a **raisin** is the dark one. In those countries a **currant** is the small dried Black Corinth grape.

By weight, raisins consist of about 67%-72% fructose and glucose (sugars), 3.5% dietary fibre, and 3% protein. Although high in certain antioxidants, raisins have less vitamin C than fresh grapes. Raisins contain no cholesterol and are low in sodium (salt).Some studies have shown that regular raisin consumption can help control blood pressure in people with mild hypertension.

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Children On Low-Protein Diet Predisposed To Hypertension In Adulthood

Medical News Today 27 Jul 2012

Studies have shown that the offspring of mothers on a low-protein diet are more likely to develop hypertension as adults. Now, Drs. Gao, Yallampalli, and Yallampalli of the University of Texas Medical Branch at Galveston report that in rats, the high maternal testosterone levels associated with a low-protein diet are caused by reduced activity of an enzyme that inactivates testosterone, allowing more testosterone to reach the fetus and increase the offspring's susceptibility to adulthood hypertension.

Fetal programming is a term used to describe the impact of maternal stress on an unborn child's physical characteristics at birth, as well as its long-term health. The placenta is thought to be a major contributor to fetal programming due to its critical roles in hormone production and nutrient transport, as well as its susceptibility to environmental disruptions.

Recently, a study found that protein restriction doubles the plasma testosterone levels in pregnant rats. Elevated testosterone levels are associated with pregnancy-related complications such as preeclampsia and polycystic ovarian syndrome in humans, and emerging evidence suggests that testosterone may play a role in fetal programming of hypertension.

Gao et al. hypothesized that the increased testosterone levels were caused either by increased activity of an enzyme that produces testosterone or by decreased activity of an enzyme that reduces testosterone, specifically Hsd17b2, which converts testosterone to a less potent androgen, androstenedione.

The team found that Hsd17b2 expression in rats was affected by protein restriction in two parts of the placenta. It was increased in the junctional zone, which is responsible for hormone production, but was reduced in the labyrinth zone, which is essential for nutrient transport from mother to fetus and also acts as a protective barrier.

Based on this novel finding, Gao et al. propose that the reduction in Hsd17b2 expression in the protective labyrinth zone may allow more testosterone to reach the fetus and play a role in fetal programming of hypertension.

The finding that Hsd17b2 was the only enzyme for testosterone production affected by gestational protein restriction suggests an important role for Hsd17b2 in regulating the testosterone levels at the maternal-fetal interface; further research is needed to determine its exact functions.
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When Sodium Leaves The Body, It Takes Calcium Along With It, Potentially Depleting Calcium Stores In The Body

Medical News Today: 26 Jul 2012

The scientific community has always wanted to know why people who eat high-salt diets are prone to developing medical problems such as kidney stones and osteoporosis. Medical researchers at the University of Alberta may have solved this puzzle through their work with animal lab models and cells.

Principal investigator Todd Alexander and his team recently discovered an important link between sodium and

calcium. These both appear to be regulated by the same molecule in the body. When sodium intake becomes too high, the body gets rid of sodium via the urine, taking calcium with it, which depletes calcium stores in the body. High levels of calcium in the urine lead to the development of kidney stones, while inadequate levels of calcium in the body lead to thin bones and osteoporosis.

"When the body tries to get rid of sodium via the urine, our findings suggest the body also gets rid of calcium at the same time," says Alexander, a Faculty of Medicine & Dentistry researcher whose findings were recently published in the peer-reviewed journal *American Journal of Physiology - Renal Physiology.*

"This is significant because we are eating more and more sodium in our diets, which means our bodies are getting rid of more and more calcium. Our findings reinforce why it is important to have a low-sodium diet and why it is important to have lower sodium levels in processed foods."

It's been known for a long time that this important molecule was responsible for sodium absorption in the body, but the discovery that it also plays a role in regulating calcium levels is new. "We asked a simple question with our research - could sodium and calcium absorption be linked? And we discovered they are," says Alexander.

"We found a molecule that seems to have two jobs - regulating the levels of both calcium and sodium in the body. Our findings provide very real biological evidence that this relationship between sodium and calcium is real and linked."

In their research, the team worked with lab models that didn't have this important molecule, so the models' urine contained high levels of calcium. Because calcium was not absorbed and retained by the body, bones became thin. A journal editorial written about this research discovery noted the molecule could be a drug target to one day "treat kidney stones and osteoporosis."

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You'd Be Amazed At How Much You Can Learn From A Plant

Medical News Today: 02 Jul 2012

In a paper published in the journal *Science*, a Michigan State University professor and a colleague discuss why if humans are to survive as a species, we must turn more to plants for any number of valuable lessons.

"Metabolism of plants provides humans with fibre, fuel, food and therapeutics," said Robert Last, an MSU professor of biochemistry and molecular biology. "As the human population grows and non-renewable energy sources diminish, we need to rely increasingly on plants and to increase the sustainability of agriculture."

However, Last and co-author Ron Milo of the Weizmann Institute of Science point out that despite decades of plant genetic engineering, there are relatively few types of commercial products originating from this body of work. "This is in part because we do not understand enough about the vastly complex set of metabolic reactions that plants employ," Last said. "It's like designing and building a bridge armed only with satellite images of existing bridges."

The authors say that perhaps the best approach is to bring together a variety of disciplines - not just plant scientists - to study how plants operate. They also suggest looking hard at what brought plants to the place they are today - evolution.

"We think that understanding design principles of plant metabolism will be aided by considering how hundreds of millions of years of evolution has led to well-conserved examples of metabolic pathways," Last said.

One of the amazing aspects of plant metabolism is this: It must continuously strike a balance between evolving to meet an ever-changing environment while maintaining the internal stability needed to carry on life as it knows it. In addition, the authors point out that plants experiment with specialized (also called secondary) metabolism which can produce novel chemicals that are used to defend against pathogens and herbivores.

"Humans benefit from this 'arms race' because some of these compounds have important therapeutic properties," Last said. "Unfortunately, design principles are not so well studied in these rapidly evolving metabolic processes. Using new approaches, including considering optimality principles, will lead to advances in medicinal chemistry as well as creating more and healthier food."

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Watermelon extract shows blood pressure benefits: Human data

By Stephen Daniells, 05-Jun-2012 Nuta Ingredients – USA

Daily supplements of a watermelon extract may help reduce moderately elevated blood pressure in obese middle-aged adults, suggests a new study.

The extract, a rich source of the amino acids l-citrulline and l-arginine, was associated with reductions in systolic and diastolic blood pressure in the arm of 15.1 and 7.6 mmHg, respectively, according to results published in the American Journal of Hypertension. Researchers from Florida State University also report similar reductions in blood pressure measured in the ankle, but no changes were recorded in heart rate.

Led by Arturo Figuero, the researchers note that the potential blood pressure lowering effects of l-citrulline and l-arginine has previously been demonstrated in adults with prehypertension and hypertension. An earlier study from the same group with 4 grams per day of the watermelon extract only reduced systolic blood pressure, however.

The new study used a dose of 6 grams per day and the benefits to both systolic and diastolic blood pressure may be dose-dependent, they said. High blood pressure (hypertension),defined as having a systolic and diastolic blood pressure (BP) greater than 140 and 90 mmHg, is a major risk factor for cardiovascular disease (CVD) - a disease that causes almost 50 per cent of deaths in Europe, and reported to cost the EU economy an estimated €169bn ($202bn) per year.

Study details

Figuero and his co-workers recruited 14 adults with prehypertension or stage 1 hypertension and with an average age of 58 to participate in their clinical trial. Participants were assigned to receive the watermelon extract (provided by Milne Fruit Products and providing a daily dose of l-citrulline/l-arginine of 6 g) or placebo for six weeks. After this period, they underwent a two-week washout period before crossing over to the other intervention group.

At the end of the study, results showed that systolic blood pressure in the arm and ankle decreased by an average of 15.1 and 11.5 mmHg in the watermelon group, compared to placebo, while diastolic blood pressure at the same sites decreased by 7.6 and 7.8 mmHg, respectively. “Interestingly, watermelon extract reduced ankle systolic blood pressure from above 175 mm Hg to below this cut-point in 50% of the subjects,” wrote the researchers.

“An ankle systolic blood pressure greater than 175 mm Hg is associated with prehypertension and hypertension and subclinical arterial damage in overweight/obese adults. A normal ankle systolic blood pressure is clinical important as cardiovascular events were lower by about two-fold in those with normal ankle systolic blood pressure than in those with high ankle systolic blood pressure during a 15-year follow-up.”

Lutein, Zeaxanthin may Reduce Cataract Risk

By Stephen Daniells, Nutra Ingredients 15-May-2012

Lutein and zeaxanthin may protect the lens of the eye from oxidative stress and reduce the risk of cataracts, says a new study.

The protective effects of lutein or zeaxanthin were reported to be similar to those of vitamin E (alphatocopherol), according to findings published in Molecular Vision. The study adds to an ever-growing body of science supporting the role of lutein and zeaxanthin for eye health, with the majority supporting their role against age-related macular degeneration, the leading cause of legal blindness for people over 55 years of age in the Western world, according to AMD Alliance International.

Finnish researchers recently reported similar findings regarding lutein and zeaxanthin and the risk of cataract. Results published in the British Journal of Nutrition (doi: 10.1017/S0007114511005332) indicated that the highest average levels of lutein and zeaxanthin were associated with a 42 and 41% reduction in the risk of cataract, respectively, compared with the lowest average levels.

Study details

The researchers took cells from the human lens and soaked them in lutein, zeaxanthin, or alpha-tocopherol for 48 hours before exposing them to the oxidizing compound hydrogen peroxide (H_2O_2) for one hour. They then measured the various markers of oxidative stress, DNA damage, and cell viability. Results showed that H_2O_2 significantly increased levels of oxidized proteins, lipid peroxidation, and DNA damage, while such damage was reduced when the cells were incubated with lutein, zeaxanthin, and alphatocopherol. “These data indicate that lutein or zeaxanthin supplementation protects lens protein, lipid, and DNA from oxidative damage and improves intracellular redox status upon oxidative stress,” wrote the researchers. “The protective effects are comparable to that of alpha-tocopherol, except that lutein and zeaxanthin cannot compensate for GSH depletion. The data imply that sufficient intake of lutein and zeaxanthin may reduce the risk for senile cataract via protecting the lens from oxidative damage.”

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Are Healthy Foods Really More Expensive? Not Necessarily, Say USDA Researchers

By Caroline Scott-Thomas, Food Navigator USA 21-May-2012

Many Americans claim that the reason they choose less healthy foods is because it costs more to eat healthily, but a new analysis from the Department of Agriculture claims that healthier foods are actually cheaper than junk foods – it all depends on how you measure value for money.

Value for money often has been measured on a price per calorie basis, meaning that foods like donuts, potato chips and confectionery are cheaper per calorie than, say, broccoli or strawberries. However, according to a new USDA study, the perception that healthy food is more expensive only stands up if calculated on this cost per calorie basis.

When price per portion or price by weight is considered instead, healthier foods like vegetables, fruit, grains, and skim milk tend to be less expensive than foods high in saturated fat and sugar – which the researchers call ‘moderation foods’ – as well as many protein-rich foods, like meat, fish and poultry.

“When making food choices, consumers may need to consider the entire cost of their diets,” the researchers wrote. “Cheap food that provides few nutrients may actually be “expensive” for the consumer from a nutritional economy perspective, whereas a food with a higher retail price that provides large amounts of nutrients may actually be quite cheap.”

The researchers, Andrea Carlson and Elizabeth Frazão from the USDA’s Economic Research Service, looked at the cost of 4,439 food items by the price per calorie, per edible gram, and per average portion consumed. Writing on the

USDA blog, Carlson said: “We found that the price measure used has a large effect on which foods are more expensive.”

However she added that in terms of meeting the government’s dietary guidelines, it is most expensive to consume meet the recommendation for fruits and vegetables – because of the relatively high recommended amount.

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Food Science & Industry News

Generation Y Wants Products for Everyday Health Maintenance

Nutraceuticals World June 27, 2012

According to the most recent NMI Health and Wellness Study, Generation Y consumers (those born between 1977 and 2002) believe in the benefits of, and are willing to pay a premium for, functional foods. The study also indicates that most consumers are using functional foods, with Gen Y reporting greater increased usage compared to the total.

To that end, Cargill announced an opportunity for food and beverage formulators to use glucosamine in products targeted to Generation Y This opportunity is based on recent consumer studies about functional foods and glucosamine from the Natural Health Institute (NHI), and new science being conducted at The Scripps Research Institute in La Jolla, CA, regarding glucosamine's role in maintaining joint health.

"The NMI study details that 59% of current Gen Y users of glucosamine use it to maintain general health," said Chuck Ray, technical services manager, Cargill Corn Milling. "Emerging science supports an opportunity for glucosamine to appeal to younger consumers, especially when incorporated into great-tasting foods and beverages."

In addition, Cargill is currently supporting novel research at The Scripps Research Institute to better understand the science behind glucosamine's role in joint health. Preliminary findings indicate that glucosamine may help to support healthy aging in the joints through the activation of autophagy, one of the main cellular "housekeeping" mechanisms. Autophagy is a critical mechanism in maintaining cellular health in joints and other tissues throughout the body, and while more research is needed, initial results show that glucosamine activates autophagy in cell culture and animal models.

"Gen Y, with an estimated $3.4 trillion in buying power by 2018, tends to be very proactive when it comes to their health," said Ray. "This science is helping us understand how glucosamine may play a role in maintaining healthy joints."

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Age, Gender Influence Breakfast Food, Beverage Choices

July 3, 2012 Food Product Design

CHICAGO—Motivations driving morning food and beverage choices vary by age and gender, according to results of a new NPD Group Morning MealScape study. The study examines morning meal and snack occasions and marries the attitudinal with behavioral motivations to reveal the "whys" behind morning selections**.**

When asked what factors contributed to their morning food and beverage choice, men aged 18 years and older said they are seeking to save money and watch their diet for things they're trying to avoid, while women of that age cite losing weight most often. For children under age 13 it's all about having something they like. The same is true for teens, but foods that look good have more importance with this age group.

"Food manufacturers interested in connecting their products with consumers in the morning should align product benefits with consumer needs," said Dori Hickey, NPD director of product development. "Understanding the why behind food and beverage selections provides the knowledge to message to your consumer targets in a way that resonates with their individual motivations."

The No. 1 and No. 2 most consumed morning meal food choices—cross age and gender—are cold cereal and fruit, respectively, but the choices after these two items vary by age group and gender. Scrambled eggs are next on the list for kids; males 18 years and older choose a banana; and females 18 and up prefer hot cereal. Many of the same foods are selected by the gender and age groups but rank differently in terms of most frequently consumed.

“The morning meal is a growing but fragmented meal occasion," Hickey said. “For food manufacturers and retailers to operate successfully in this meal space, they need to understand the ‘why’ behind consumers’ morning meal behaviors."

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Scientists Create ‘Nutritionally Balanced’ Pizza

July 3, 2012 Food Product Design

GLASGOW—Scottish scientists claim they have created the world’s first nutritionally balanced pizza that contains 30% of an adult's guideline daily amount of vitamins and minerals and one-third of the recommended amount of calories, protein and carbohydrate.

The Eat Balanced pizzas use all-natural, high-quality ingredients and that don’t take away from the classic pizza taste and convenience. The range currently includes Cheese and Tomato, Ham and Pineapple, and Spicy Chicken.

The idea for the pizza line was born out of frustration that one of the world’s most popular foods was not nutritionally balanced. Scottish entrepreneur Donnie Mclean in association with Glasgow University’s nutrition expert Professor Mike Lean created the new pizza line that contains the correct proportions of calories, proteins, carbohydrates, fats, salts, sugar, fiber, vitamins and minerals that humans need for a balanced meal.

They substituted unusual ingredients, such as seaweed, to reduce sodium content to 3.5% of daily intake compared to frozen pizzas’ daily average of 40%. The pizzas also contain vitamin C-rich crushed red pepper in the tomato sauce along with vitamin B12, vitamin A, magnesium, potassium and folate to boost the nutritional profile

“The concept of a balanced diet is well established in people’s minds; however, it’s not easy to make sure that you are getting exactly the right balance of what you need from each meal. I wanted to prove that a balanced meal could still be properly tasty, by choosing one of the nation’s favorite foods," said Mclean.

The frozen pizzas are expected to hit U.K. retailers in the near future.

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Good News About the Glycemic Index of Rice

Science Daily (July 8, 2012)

Research analysing 235 types of rice from around the world has found its glycemic index (GI) varies from one type of rice to another with most varieties scoring a low to medium GI.This finding is good news because it not only means rice can be part of a healthy diet for the average consumer, it also means people with diabetes, or at risk of diabetes, can select the right rice to help maintain a healthy, low GI diet.The study found that the GI of rice ranges from a low of 48 to a high of 92, with an average of 64, and that the GI of rice depends on the type of rice consumed.

The research team from the International Rice Research Institute (IRRI) and CSIRO's Food Futures Flagship also identified the key gene that determines the GI of rice, an important achievement that offers rice breeders the opportunity to develop varieties with different GI levels to meet consumer needs. Future development of low GI rice would also enable food manufactures to develop new, low GI food products based on rice.

Dr Tony Bird, CSIRO Food Futures Flagship researcher, said that low GI diets offer a range of health benefits.Dr Melissa Fitzgerald, who led the IRRI team, said GI is a measure of the relative ability of carbohydrates in foods to raise blood sugar levels after eating."Understanding that different types of rice have different GI values allows rice consumers to make informed choices about the sort of rice they want to eat," she said."Rice varieties like India's most widely grown rice variety, Swarna, have a low GI and varieties like Doongara and Basmati from Australia have a medium GI."

Dr Tony Bird, CSIRO Food Futures Flagship researcher, said that low GI diets offer a range of health benefits."Low GI diets can reduce the likelihood of developing Type 2 diabetes, and are also useful for helping diabetics better manage their condition," he said."This is good news for diabetics and people at risk of diabetes who are trying to control their condition through diet, as it means they can select the right rice to help maintain a healthy, low GI diet."

Low GI foods are those measured 55 and less, medium GI are those measured between 56 and 69, while high GI measures 70 and above.When food is measured to have a 'high GI', it means it is easily digested and absorbed by the body, which often results in fluctuations in blood sugar levels that can increase chances of getting diabetes, and make management of Type 2 diabetes difficult.

Conversely, foods with low GI are those that have slow digestion and absorption rates in the body, causing a gradual and sustained release of sugar into the blood, which has been proven beneficial to health, including reducing the chances of developing diabetes.

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Pictures of high-calorie foods may increase cravings

A study presented at the Endocrine Society's annual meeting in Houston, Texas, shows that looking at pictures of high-calorie foods may trigger cravings for fattening foods, especially if consuming a sugar-sweetened beverage at the same time. Researchers from the University of Southern California found that drinking a sugary beverage while viewing these foods activates appetite and reward centers in the brain, which could play a role in obesity.

The researchers measured the brain responses of 13 obese, Hispanic females, ages 15–25 years, as they looked at both high-calorie and low-calorie foods. Using functional magnetic resonance imaging (fMRI), the women's brains were scanned twice as they viewed images of foods such as hamburgers, cookies, cakes, fruits, and vegetables. After seeing all of the images, they were asked to rate their hunger as well as their desire for sweet or savory foods.

Halfway through the scans, the women drank 50 g of glucose, which is similar to drinking a can of sugary soda. In a separate instance, they drank 50 g of fructose. Glucose and fructose are found in table sugar and high fructose corn syrup.

The researchers found that the reward areas in the women's brains were activated when they looked at high-calorie foods. Interestingly, consuming the glucose and fructose increased the participants' hunger and desire for savory foods. The researchers pointed out that fructose resulted in more intense cravings and hunger among the women than glucose.

The researchers said they limited the study to Hispanic women because research has indicated women are more sensitive to food cues, and the Hispanic community has a high incidence of obesity and type 2 diabetes. More studies are needed to explore whether these cravings are due to obesity or genetics, the authors noted.

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Regulatory & Safety News

Trans Fat Ban Has Led To Healthier Fast Food Meals In NYC

Medical News Today: 17 Jul 2012

The ban that New York City authorities introduced in 2006 to restrict use of trans fats in fast-food restaurants has led to residents eating healthier fast food meals that are substantially and significantly lower in trans fats. Also, those meals have not increased their saturated fat content to compensate.

These are the findings of a new study published online in the *Annals of Internal Medicine* on Tuesday. According to the authors, all employed by the New York City Department of Health and Mental Hygiene at the time of the analysis, this is the **first hard evidence that trans-fat regulations in local communities can make a difference in their dietary intake**.

Although existing at low levels naturally in animal-derived foods such as meat and dairy, trans-fats in the diet come mainly from oils that have undergone hydrogenation to make them hard, easier to use in cooking and frying, and to increase shelf life of processed foods.

New York City authorities introduced a restriction on the use of trans-fats in chain restaurants because of evidence that their consumption can increase risk of coronary heart disease. **Just 40 calories of trans-fat a day can raise the risk of heart disease by up to 23%, which is particularly significant in the US, where more than one-third of daily calorie intake comes from food bought outside the home.**

For the study, the researchers surveyed customers at 168 randomly selected outlets of 11 fast food chains in New York City and asked them questions about what they had bought at lunchtime.In the meantime they also compared the trans-fat and saturated fat content of nearly 7,000 fast food meals bought before the 2006 ban to meals bought after the ban.

The results showed the fast food meals that the surveyed customers bought were different before and after the ban in terms of their fat content. The average lunchtime purchase dropped by an average of 2.4 grams of trans-fat per customer.The biggest drop in trans-fat content was in purchases bought at hamburger chains, followed by Mexican food and fried chicken chains.

There was also an increase in the number of meals that contained no trans-fats at all. Had the customers bought their meals before the ban, 32% of them would have had no trans-fats: after the ban this went up to 59%.When they analyzed the locations of the outlets, the researchers found "**the poverty rate of the neighbourhood in which the restaurant was located was not associated with changes**".

In an accompanying editorial, Alice Lichtenstein, a nutrition specialist at Tufts University, writes:"The regulation may serve as a model for future successful public health initiatives."

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Menu labeling requirements lead to healthier restaurant options

IFT Newsletter July 25, 2012

The recent U.S. Supreme Court decision on the Patient Protection and Affordable Care Act has cleared the way for national requirements about posting nutritional information at chain restaurants. Listing calories, fat content, and sodium levels of menu items at the point of purchase has been promoted as a way to address the obesity epidemic. A study published in the *Journal of the Academy of Nutrition and Dietetics* has evaluated the real-life impact of menu labeling in King County, Wash., after new regulations were implemented, and has found some improvement, although most entrées continue to exceed recommended nutritional guidelines.

King County was one of the first jurisdictions to implement menu labeling in January 2009. The regulations applied to any restaurant with 15 or more establishments in the United States and at least $1 million in annual sales. The researchers wanted to learn whether restaurants would improve their entrées by reformulating items so that they had fewer calories and would replace some menu items with healthier alternatives.

The investigators audited menus at 11 sit-down restaurants and 26 quick-serve chains. They evaluated the nutritional levels of entrées that were on the menu six months after the regulations went into effect and remained on the menu 12 months later, to determine whether individual menu items had been reformulated to improve their nutritional profiles. They also looked at whether all entrées had a better nutrition profile. They compared the nutritional values of entrées at the restaurants in their study to U.S. Dept. of Agriculture (USDA) *Dietary Guidelines*.

The researchers found evidence of a decrease in energy, saturated fat, and sodium content after the implementation of menu regulations for items that were on the menu at both time periods. They also saw a trend for healthier alternatives across all entrées over time, but only in the sit-down restaurants.

However, the study found that the majority of entrées were still very high in energy, saturated fats, and sodium, compared to *Dietary Guidelines for Americans*. Fifty-six percent of entrees exceeded the recommended level for a third of an adult's daily needs, while 77% of the entrees exceeded the guidelines for saturated fats, and almost 90% exceeded the sodium guidelines.

With national guidelines from the Food and Drug Administration expected later this year, the researchers concluded that consumers need more options in the marketplace and clearer messages about how to use menu labeling information.

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WTO rules against U.S. country-of-origin labeling

IFT Newsletter July 5, 2012

According to *Bloomberg*, World Trade Organization judges upheld an earlier ruling backing Canada and Mexico stating that U.S. country-of-origin labeling (COOL) provisions violate global trade law and unfairly curb agricultural commerce.

Under U.S. law in force since March 2009, food processors must identify the nations from which cattle, hogs, and some fresh produce originate. Canada and Mexico said the provisions impose unjust costs on their exports, reducing their competitiveness. WTO judges agreed on Nov. 18 that beef and pork from Canada and Mexico were treated less favorably than the same U.S. products.

Mexico and Canada complained at the Geneva-based WTO in December 2008, challenging provisions of the U.S. Food, Conservation and Energy Act that impose mandatory country-of- origin labeling, known as COOL, for beef, pork, chicken, lamb and goat as well as some perishables sold by U.S. retailers.

COOL has caused many U.S. pork-processing companies to stop buying animals born in Canada and has cost the country's pork industry millions of dollars, according to the Canadian Pork Council, a federation of nine provincial pork industry associations. The law costs the Canadian cattle industry C$400 million annually, the Canadian Cattlemen's Association says.

The Food Marketing Institute (FMI) issued a statement from Regulatory Counsel Erik Lieberman after the WTO affirmed that COOL law is an illegal trade barrier. "The WTO Appellate body ruled Friday [June 29, 2012] on Canada and Mexico's complaint against the United States' COOL law and found that the burdensome recordkeeping and verification requirements of the meat program violate U.S. commitments under international trade agreements. COOL has forced the industry to spend tens of millions of dollars each year on unnecessary regulatory burdens—all for little-to-no benefit to consumers—which make it more expensive and difficult for supermarkets to provide customers with the consistent, high quality, and affordable imported products they deserve. With the appeals process exhausted, it's now time for Congress and the U.S. Dept. of Agriculture to address the wastefulness of the program and create a less burdensome system."

Additionally, the American Meat Institute (AMI) agreed with the WTO ruling: "The WTO has spoken not once but twice: mandatory country-of-origin labeling (COOL) violates our WTO obligations. While the law's proponents continue to defend it and to challenge the WTO perspective, it's time to 'get over it.' Trade has been an essential part of the U.S. livestock and meat industry's success and our nation needs to lead in trade the trade arena by example."

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Product Approval – An Arbitrary Process

Dr. J. I. Lewis, Chairman, Regulatory Affairs Committee, PFNDAI

Most of those who have read the intent and meaning of the Food Safety & Standards Act 2006, would have anticipated the dawn of a regulatory system where rulemaking was risk based, transparent and embodied on certain principles.

The Act with elaborated clarity requires the Authority to take regulatory measures proportionate and no more restrictive of trade while ensuring public health. To discourage ad hoc-ism, it pointedly directs that measures should be consistent with international practice where these exist. The Product Approval system now in force is woefully short on the principles espoused in the Act. It is another instance of the triumph of mindset over spirit of rulemaking as envisaged in the Act.

An unobtrusive insertion at Serial No VIII in Schedule 1 of the Food Safety & Standards (Licensing & Registration) Rules 2011 – which reads " all food business operators (FBO) manufacturing any article of food containing ingredients or substances or using technologies or processes or combination thereof whose safety has not been established through these regulations or which do not have a history of safe use or food containing ingredients which are being introduced for the first time into the country' – they need to apply for Product Approval at FSSAI Headquarters before applying for license.

Procedures are not invented everyday

The first advisory on Product Approval appeared in January 2012 with regard to foods falling under Item VIII of Schedule 1 under the Food Safety & Standards (Licensing & Registration) Regulations 2011. Schedule 1 merely provided directions to FBO have to seek Central license for the foods listed therein. The intent was possibly on the understanding that State licensing authorities may not be sufficiently informed on this particular regulatory provision. The Authority had rightly intended through this 'stand in' definition to identify novel foods prior to or concurrent to providing them a license through the Central Licensing Authority. The matter was simple and well isolated in description under Item VIII. What followed was an apparent misreading that led to a cascade of ill informed advisories which greatly diminished industry's confidence of science based regime under the Act.

The Product Approval System in a sense raised several inadequacies – understanding of regulatory processes of approval systems and the regulators inability to comprehend its own food category distinctions. The first ludicrous step was of instituting post market approval of products in sale and consumption for several years. The ostensible reason posted being the need for the Authority to assess its safety – a case of locking the stable doors after the horse has bolted. Secondly it was unable to distinguish between novel foods and proprietary foods although the latter could have had foods that contained novel foods/ingredients. It could have refined the advisory to exclude proprietary foods containing only commodity ingredients such as sugar, oil, cereals, soy protein etc, foods being eaten for several decades. As a result several 'non standardized foods' (read proprietary) commonly eaten such as

samosa, gulab jamun, suji were suddenly raised to an enviable status of requiring safety assessment by an Approval Committee – who most likely would have consumed and enjoyed these foods in full measure – but thereafter exempted them under an ingenious discovery of 'traditional foods'.

Regulatory procedures that kick in when a new regulation is notified is either to ' grandfather' products in the market but fall under this regulation – which means they are exempt from the requirements of the new regulation. A case in point is the Dietary Supplement Health Education Act 1994, where dietary supplements prior to that date are exempt from safety assessment and considered 'old dietary ingredients' as opposed to those entering market post the regulation. Another procedure is to authorize ingredients (typically novel) or food additives (substances added to food) for use in foods/food categories (with restrictions if any) and not products (which are a composition of ingredients and additives only). An authorization process is in fact being followed for approval of food additives by FSSR through its Scientific Panel on Food Additives and previously by CCFS – a similar process should have been instituted for novel food/ingredients over a specified time frame. Regulatory processes cannot be arbitrary or invented on a daily basis as we have experienced with the current Approval Process.

Needless to add a stream of errors followed making the entire process a travesty of regulatory practice. The intent of the innocuous entry VIII in Schedule 1 was to identify novel foods/ingredients in products currently placed on the market but instead it moved like a bush fire into proprietary foods while not identifying a single novel food ingredient thus far.

Novel and Proprietary foods are distinctive regulatory entities

It remains unclear why the Authority did not expressly state its intention requiring novel foods/ingredients to be registered with CLA and avoid the confusion that followed. The listing of 'novel foods' under Item VIII for Central Licensing was notified on 5th August 2011 – and the advisory followed almost six months later. The description under item VIII in fact exonerates such foods in the market – for the simple reason that if the food was pre-existing in the country at the time of licensing/registration it ceases to be 'novel' – and the requirement would be applicable only for new introductions. This is amply borne out from the EU Novel Food Regulation 258/1997 that defines novel foods and novel food ingredients as those that have not been used for human consumption to a significant degree in the EU before 15 May 1997 (the date the regulation came into force). A similar procedure consistent with international practice could have been followed – India has yet to make a novel food regulation.

Novel foods are considered to be so because safety has to be established where significant use as food has not been established in the country – a kind of safety check before allowing them to enter the market. On the other hand proprietary foods are foods where product standards (compositional) have not been specified in the regulations – safety checks are not required in their case as they are largely made up of commodity or approved ingredients. This difference should have been appreciated. A menacing prospect emerging is that if impending regulation of foods under Section 22 of the Act is unable to bring out the distinctions between several categories of foods or their regulatory differences not understood Industry will experience considerable turmoil. In addition field enforcement without a clear understanding of the distinctions can run amok during implementation – a lesson learned from the Approval Process.

Distinction of Safety and Regulation

Another key point emerging from this episode is an understanding of the distinctions between safety and regulations (and compliance thereof) of novel and proprietary foods. This understanding is inherent to the mindset of the way regulators under previous regimes ruled. Food safety seemingly had no space in the regulatory mindset. For example;

Regulation 2.12 of the Food Safety and Standards (Food Product Standards and Food Additives) Regulations, 2011 is a regulation on proprietary foods - subsumed from the erstwhile PFA. Sub clause (ii) of 2.12.1 requires proprietary foods to be compliant with all regulatory provisions specified in these regulations and in Appendices A (Food Additives) and Appendix B (Microbiological Standards) of FSSR 2011. Logically therefore a food that *complies with all regulatory provisions* in addition to those under Appendices A and B are deemed to be safe, *unless all regulation therein are deficient* in food safety (and this is not so).

The regulatory principle here is that general standards (referred to as horizontal standards) are applicable to all foods placed on the market whether standardized or not. Codex follows a similar principle that all foods whether standardized or not are required to comply with the General Standards with regards to labelling, pesticide and contaminant limits, food additives and microbiological standards. To harmonize with Codex therefore requires all foods (proprietary/standardized foods covered under FSSR 2011) comply with the General Standards. So why were proprietary foods comprising commodity ingredients (samosa, gulab jamun) selected for safety assessment when they are all in compliance with general standards? Compliance is tested in the market place – hence what test data was considered to deem these products more 'unsafe' that standardized foods?

The key point emerging is the belief that 'standardization' means safety in some convoluted way. A view of product standards reveals no specification relates to 'safety' and is more in the realm of quality and identity. Safety is regulated through the general standards and not product standards.

World over standardized foods are a small proportion of all foods placed on the market. For example Codex has only 190 commodity standards compared to India which has approx. 380, while there are more than 10,000 food products on the market that do not bear standards. The vast majority of food products are expected to comply with the General Standards (horizontal) which are defined safety standards.

An interesting example of the difference between safety and regulation is the case of chicken tandoori masala in the UK. In 2004, Trading Standards Officers tested over 100 takeaway Chicken Tikka Masala curries. About 57% were found to contain illegally high levels of artificial colourings including tartrazine (E102), sunset yellow (E110) and ponceau 4R (E124). Although the levels were higher than permitted, evidence from the Food Standards Agency suggests that they were not harmful (unsafe). A person would need to eat more than 500g of the illegal chicken tikka masala every day for several years before the colourings caused health problems.

The prejudice against non standardized foods continues and is deeply embedded in the thinking of the regulator. Several food supplements imported into the country are lying under detention on account of them containing 'non permitted food additives' as per regulation 3.1.3 of FSSR 2011. The cited regulation does not include food supplements and a referral to them is misplaced. While the Act recognises food supplements as a distinct food category, the regulations have yet to be notified.

Regulations should be well understood prior to enactment – it's not a patchwork of web based texts. The authorship of rulemaking (domain of risk management) needs reformation beyond the *ad nauseum* harp of 'harmonizing with Codex'. The Act promised a risk based, open and transparent system but instead created its own swell of inconsistent regulatory procedures as in the past - reminiscent of the quote by Anne Porter; "the past is never where you think you left it"