VALUE ADDITION IN MILK & DAIRY PRODUCTS

Dr J.V. Parekh, Consultant, Dairy Processing Industry

DAIRY INDUSTRY PROFILE (2012-2013)

India is currently self sufficient and the largest producer of milk in the world, a status it has maintained since the late nineties. This has been largely achieved through a combination of favourable policies and an institutional network that has helped support millions of rural households in pursuing their livelihoods through small scale dairy farming. About one-fifth of the milk produced is collected and processed by the organized dairy sector. Cooperatives now link more than twelve million small scale dairy producers to urban markets and provide them a stable source of income. The dairy industry in India is going through major changes with the liberalization policies of the Government and the restructuring of the economy. This has brought greater participation of the private sector. This is also consistent with global trends, which could hopefully lead to greater integration of Indian dairying with the world market for milk and milk products. India today is the world's largest and fastest growing market for milk and milk products with an annual growth rate of about 4.5 per cent.

India is witnessing winds of change because of improved milk availability, a change-over to market economy, globalization, and the entry of the private sector in the dairy industry. Value addition and variety in the availability of milk products is on everybody's agenda. There is an increasing demand for new products and processes. The main reasons are - an increase in disposable incomes; changes in consumer concerns and perceptions on nutritional quality and safety; arrival of foreign brands; increasing popularity of satellite/cable media; and availability of new technologies and functional ingredients. From conventional milk products like paneer and cheese, the market has evolved over time and now caters to the wellness market as well with its sugar free and probiotic milk products.

Increased urbanization has given a boost to demand for health products. Moreover, with rise in disposable income and educational level, the awareness for nutrition and health improves which in turn raises the demand for health and nutritional products. Market studies indicate that consumers are looking for healthier alternatives. Keeping this in mind, companies have introduced a range of functional products. After introducing India's first sports and energy drink Stamina, Pro-biotic Ice-creams, Pro-biotic Lassi and Curd, and High Calcium Milk, Amul has also introduced Reduced Salt Butter in order to give the consumers a wide choice of health products. Another example is Nestle which introduced Nesvita Pro-Heart Milk with Omega 3 that helps manage Cholesterol.

Presently India produces 125 million tonnes milk per year. India's milk production today accounts for more than 15 percent of the total world output and 40 percent of Asia's total production. It continues to grow at about 4 percent per annum far exceeding the global average of 1.2 percent in recent years.

Out of the total milk production, 77 percent is sold as liquid milk, with the balance of 23 percent converted into products. The size of the Indian dairy industry is expected to more than double to Rs 520,000 crore in 2020

NATIONAL DAIRY PLAN

To address issues of increasing demand and greater coverage of producers by the organized sector, A National Dairy Plan covering a 15 year period has been formulated aimed at meeting the projected demand of about 180 million tonnes of milk by 2021-22. With an estimated outlay of about Rs 17,371 crore, the Plan has three major components—enhancing milk production through increased productivity; strengthening/expanding the infrastructure for procurement, processing, marketing and quality assurance through existing institutional structures and by promoting new ones; and, human resource development. NDP aims to increase the productivity of milch animals by adopting focused, scientific and systematic processes including generic improvement of ~~our~~ milch animals.

Today milk stands first as the largest source of agriculture income in India. Th~~r~~ough milk production per day is 325 million litres, organized sector handles only about 30 percent of the total milk production (doubled—from 15 per cent a decade ago). This is seen as an encouraging sign, with most big players assuring quality checks at multiple points. The fast expanding private sector investment and entry of global players is also intensifying competition—Fonterra, Danone, London Dairy, Dairy Lite and Baskin Robbins, among others, have already entered the high-end milk products segment in India. Many other foreign brands—including New Zealand Dairy Board and the Irish Dairy Board—are reported to be looking for partners to enter the Indian market.

Alongside, the number of Indian private sector biggies entering the field is growing with Reliance Dairy Foods, Kishore Biyani's Fresh and Pure and Jaypee Group joining the ranks of Hatsun Agro, Paras, Saras, Britannia and Nestle among others. Today, the share of private players in the organized milk processing sector has risen to around 40 per cent. This is good news. As the organized sector expands, experts are pinning hopes on competition to ensure better quality delivery. Of course, be prepared to pay a higher price for it too. As an industry veteran put it: "What is inflation for consumers is income for farmers." That's what they call milk for thought.

NDP will help provide rural milk producers with greater access to the organized milk processing sector. The National Dairy Development Board (NDDB) is all set to roll out its ambitious 15 year long National Dairy Plan (NDP) at an outlay of Rs. 17300 crore. The Union Government had approved the National Dairy Plan Phase - I (NDP – I) with an outlay of Rs. 2242 crore. It is a six year plan that will be implemented in the 14 major milk producing States of Uttar Pradesh, Punjab, Haryana, Gujarat, Rajasthan, Madhya Pradesh, Bihar, West Bengal, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Orissa and Kerala.

The scheme will be largely financed with loan from the International Development Association (IDA) of the World Bank and implemented by NDDB through End Implementing Agencies (EIAs) located in the States. High Margin dairy products like yogurt, ice cream and cheese constitute only ~8% of the Indian dairy market currently; expected to grow at CACR ~25% over next 5 years. Figure No. 1 indicates expected growth trends in the high margin value added products.

Fig.: 1 Growth trend in High Margin Value Added Products

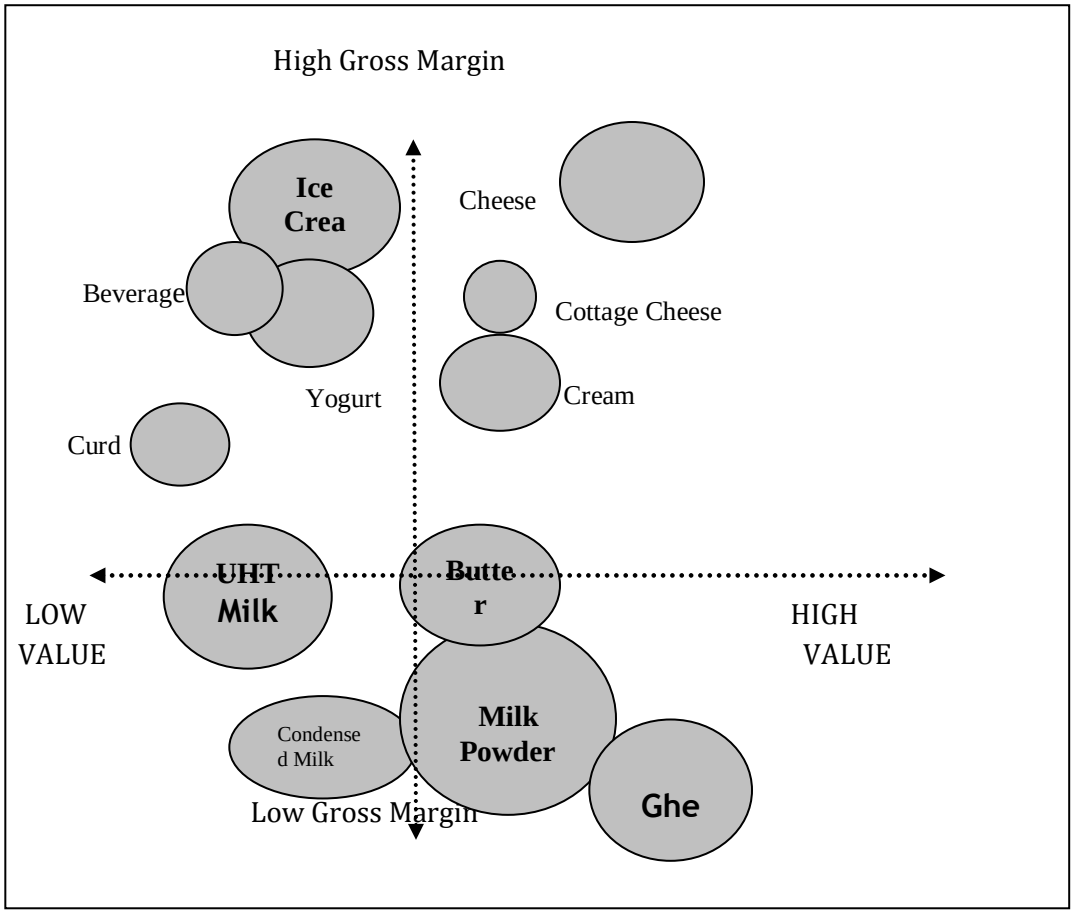

Table 1 gives some examples of commodity products as well as value added products of the dairy industry. Table 2 gives some possible commercial utilization of individual milk components with their importance.

Table1: Value added products of dairy industry

Commodities	Value added products
Full Cream Milk Powder Skim Milk Powder Butter Butter Oil/ Ghee Cheddar cheese Caseinates MPC 70 Lactose	• Whey protein Isolates • Whey protein concentrates • Functional MPC • Specially designed dairy ingredients • Functional MPC and WPC ingredients for Yoghurt, Analogue cheese, Protein bars etc. Lactoferrin • Colustrum MPC/Immunoglobulin • Protein fractions • Whey protein hydrolysates • Probiotics • Complex carbohydrates • Complex lipids

Table 2: Importance of milk components w.r.t. commercial value addition

Compounds	Properties	Uses
α-lactoglobulin	Nutrition, carrier of retinol and its fatty acid	Infant formula, Humanized milk
ß-lactoglobulin	Gelling, solubility and nutrition	Restructured meat and fish
Immunoglobulins and bovine serum albumin	Anticancer, Enhanced immunity	Cancer prevention and treatment, diet for person who are HIV Positive, have AIDS
Lactoferrin	Antibacterial	Infant Formula, health foods
Lactoperoxidase	Anticaries, important component of LP system, antimicrobial	Tooth paste, Tumor therapy, Cosmetics
Whole protein co precipitate	Balanced amino acid profile	Nutritional beverage
Whey protein isolates	Functional performance	Egg substitute in bakery industry, Fat replacer in ice cream and frozen dessert
Protease-peptones	Immunomodulatory	Prebiotic foods
Immunoglobulin	Provide passive immunity	Cancer prevention
Casein (acid)	Functional properties	Glue, paints, leather, rubber, textile, plastic industries
Casein (rennet)	Stretch properties	Analogue cheese preparation
When protein concentrate (WPC)	Special performance, solubility, gelling, emulsifying, foaming agent	Value added products, health beverages and egg substitute in bakery products
When protein hydrolysates	Nutritionally rich, reduce allergenicity, solubility over a wide range of pH	Infant health foods, geriatric foods, Athletic drinks
Lactulose	Bifidobacteria enhancement, laxative, oxygen uptake, ammonia reduction in blood	Infant formula, laxative, diet for athletes
Lactitol	Bifidobacteria enhancement, noncaloric sweetener	Infant formula, chewing gum
Lactobionic acid	Bifidobacteria enhancement and other health related uses	Various food applications
Oligosaccharides	Bifidobacteria enhancement	Infant formula, baby foods, yoghurt, fermented dairy products
Mixture of salts recovered from when UF permeate	Flavor, nutrition, low sodium content	Table salt substitute, health drink

How This Can Be Done?

1. Through Strong Research and development capability, implementing New Technology
2. Continuous innovation and meeting customers demand
3. Ingredients tailored to customers need/ functionality required in the Final product

KEY ISSUES AND OPPORTUNITIES

In the last 5 years, USD 150 Mn has been invested by private equity investors in the Indian dairy industry, of which USD 125 Mn has come in the last 18 months. The capital raised has largely been

invested in backward and forward integration of the private dairy companies. Private equity investors are encouraging Indian companies to move up the value chain. The key issues faced and opportunities available have been summarized in table 3.

Table 3: Key issues and opportunities for dairy industry

Issues	Opportunities
Low Value Addition (Liquid milk)	
Liquid milk accounts for ~75% of total volume sales for most Indian dairy companies. Liquid milk is a very competitive and price-sensitive market with typical margins of 4%-5%.	Value added segment has been growing at a healthy 20%-30% on a small base
Mostly Regional Players	
Except Amul (pan-India player), all the other domestic players cater to specific regions Lack of cold storage facilities is the biggest inhibitors for regional players trying to gain a national presence.	Emergence of few national players over medium term
Sourcing Network	
Unlike Europe /USA where an average framer has 150-200 cattle, Indian dairy farmer has 2-3 animals Quality of raw milk procured varies with region and season. High capital is required to set up infrastructure at the village level	Setting up of organized cattle farms are being by dairy companies
Exports	
In 2012-13, India exported only 87,800 tonnes of dairy products out of its total production of 132 million tonnes (<0.1%). However in FY 2014 India exports were Rs. 5000 Cr+	Tremendous export potential exists to milk deficit countries like Bangladesh, Indonesia, Malaysia, Philippines, South Korea, Africa, Middle East etc

Processing technology for value addition

ASEPTIC PROCESSING AND PACKAGING

Considered as the single most important innovation for food products in the last half-century, it involves producing shelf-stable products by sterilizing product and the packaging material or container separately and filling in a sterile environment. It was popularized in India with the success of fruit juices drinks & milk such as Frooti and Amul Taaza. Milk with a long shelf-life is currently produced by three different processes:

- Conventional sterilization
- UHT treatment
- Two-stage sterilization

UHT Milk in Aseptic Pouch

UHT milk has a singular and distinct advantage of not requiring any cold chain and depending upon the initial milk quality and type of package can present a shelf life from 2 to 6 months under

ambient conditions. Both the processing and packaging add to the cost to the consumer significantly and hence for many years to come it would still remain a product to be chosen on the basis of need, affordability and specific requirement.

MEMBRANE PROCESSING*:*

Recently, membrane processing has gained importance over conventional processes in food industry for its advantages that are well known and established. Membrane processing has presented new possibilities for the production of newer intermediate dairy products that can be used in different foods based on their functional properties. Some membrane based processes are:

- Reverse Osmosis (RO)
- Nanofiltration (NF)
- Ultrafiltration (UF)
- Microfiltration (MF)

Reverse Osmosis

The Reverse Osmosis membranes are characterized by a molecular weight cut off of nearly 100 daltons and the pressures involved are 5-10 times greater than those used in UF. The potential applications of RO Technology are:

1) Bulk transportation of R.O. concentrated milks.
2) Utilization of pasteurized RO concentrate in place of market milk.
3) Preconcentration of milk for khoa making and spray drying.

Nanofiltration

Nanofiltration allows divalent ions to pass through while retaining the organic molecules, It separates particles with molecular weights in the range of 300-1000 daltons. Operating pressures required are nearly 300 psig. Nanofiltration applications in the dairy industry are related to the capability of the process to selectively remove ionic particles. NF is used for demineralization of whey UF permeate prior to manufacture of lactose. It is also used for deacidification of sour whey and for removal of sodium chloride from salty cheddar cheese whey.

Ultrafiltration

UF membranes allows separation of smaller molecular weight substances ranging from 10,000 to 75000 daltons with operating pressures ranging between 10 to 200 psig. The ultrafiltration technology can be used for :

1) Deproteinization of whey
2) Fractionation of proteins
3) Milk protein standardization
4) Preparation of Biological peptides.
5) Cheese making

6) Manufacture of rasogolla mix powder
7) Manufacture of milk protein concentrate
8) Manufacture of low lactose powder

Microfiltration

In microfiltration, membranes with pore sizes ranging from 0.1 to 10 micron and the operating pressures in the range of 1 to 25 psig are used. MF is essentially employed as a clarifying operation to remove macromaterials and suspended solids, milk fat globules, bacteria and colloidal particles. Of these, the most significant application of MF is for selective separation of bacteria from milk. The MF system is capable of removing 99.5% of all the bacteria in skim milk, and when used in combination with pasteurizer or UHT processing can substantively improve the thermal efficiency and shelf life of resultant products. MF system can also be used for separation of native casein from whey proteins and for isolating peptides for Pharmaceutical applications.

OTHER PROCESSES LEADING TO VALUE ADDITION

Application of supercritical extraction

In the dairy industry, the potential of SFE for the removal of cholesterol and fractionation of milk fat has been investigated by several researchers and commercialized

Spinning Cone Column Technology (SCC) For Flavour Management

Flavoaurtech's Spinning Cone Column is the world's fastest, most efficient and cost-effective method for the capture and preservation of volatile flavour components, from all kinds of liquid or slurry substances. This unit handles a wide range of products, such as Dairy products like milk, cream, hot beverages like tea, coffee, malt drinks.

Bactofugation

The process involves subjecting milk to high speed centrifuging at around 50-60^{0}C to remove bacteria of milk. The process can be adopted selectively before or after pasteurization depending on the equipment. The process is reported to remove 70-80% of bacterial cells from milk depending on the initial load.

Super heated water spray sterilizer

A new method of sterilization has been developed called "Super Heated Water Spray Sterilizer" for heat sensate products. This is suitable for delicate containers like plastic bottles. This system is suitable for rapid heating and rapid cooling for heat liable products.

Conclusion

There are continuing efforts to evolve techniques and technologies that are consumer and nature friendly, low cost, of improved productivity, energy economic and capable of producing nature resembling products with undoubted safety features. By the application of some of these technologies to improve the production and shelf life of food products it is possible to achieve better penetration of distant market in not only the country but even for export.

Current food processing trends as well as inflow of new foods into the market are driven by consumers' choices and novel technologies. Within the next twenty years, the world population is expected to increase by two billion people with majority are youth and urban. Further, worldwide non-communicable diseases such as obesity, diabetes, cardiovascular diseases and cancer have become major health problem due to the changing lifestyle and dietary pattern among people.

As consequence, interesting changes can be expected in the way dairy and food products are processed, packaged and marketed. In general, the functional attributes of foods are enhanced by incorporating in them certain ingredients that possess health promoting benefits. A recent survey conducted by a leading management firm in South Asia revealed that the health and wellness foods market in India is projected to increase from current Rs. 10, 150 crore to Rs. 55,000 crore by the year 2015.

❁❁❁

Recent Trends in Development of Fermented Dairy Products

Dinesh C Pandey* & Mahesh Satpute
Innovation Centre, Mother Dairy Fruit & Veg Pvt Ltd, Patparganj, Delhi-92.
*dinesh_pandey_001@yahoo.com

Introduction

Soured milk would have invented itself as soon as humankind started milking animals. The history of when specific lactose-digesting bacterial cultures were first used and intentionally propagated will never be known with certainty, but residues from ancient fragments of potsherds, apparently designed to act as strainers, have been dated as far back as 8500 years ago. Such "domesticated" fermentative organisms serve the very useful dual purposes of partial lactose digestion and provision of β-galactosidase (lactase), which continues to break down lactose after consumption. Both of these attributes would have assisted early humans in tolerating the substantial lactose loads that accompany milk consumption and would otherwise cause seriously debilitating adverse gastrointestinal effects. In all mammalian species, intestinal lactase, highly active when the young are receiving their mother's milk, is down regulated in a coordinated manner speculated to be a natural part of weaning the offspring away from mammary feeding so that the mother can initiate a new reproductive cycle. The result is that older offspring and adults become lactose intolerant; they fail to break down the lactose disaccharide, thus causing Lactose Intolerance but can be rapidly resolve with a lactose-exclusion diet. Thus Fermented Milk Products came in picture and became vital part of our daily diet.

Milk proteins: a cornucopia for developing functional foods

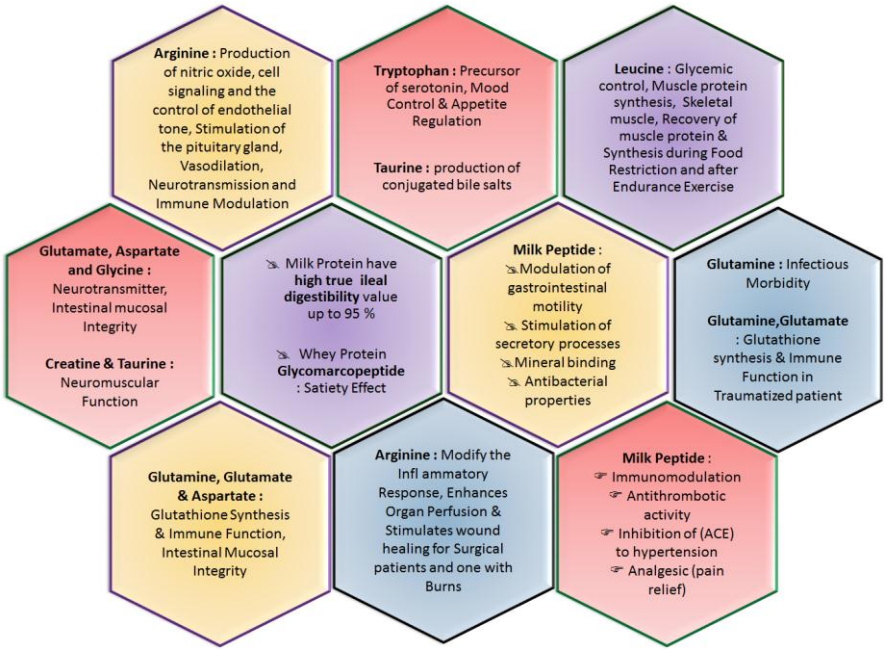

Fig 1: Milk Proteins: A cornucopia for Developing Functional Foods

Milk is an excellent example of a food having both nutritional and non-nutritional physiological roles in the human diet. Milk proteins not only supply the body with amino acids necessary for the maintenance and growth of body protein, but also give rise, during food manufacture and/or food digestion, to a myriad of protein fragments and large and small peptides that have distinct biological functions.

Amino acids released during digestion have regulatory functions or act as precursors for the synthesis of key non-protein metabolites. Such compounds are a rich source of bioactive components for the development of functional foods. Fig.1 lists the key functional roles of Milk proteins, amino acids and bioactive peptides.

Functional Products: Concept to commercialization

A fundamental characteristic of breakthrough products is their ability to meet consumer needs, providing added value and benefit for the consumer. In addition, breakthroughs have been defined as products, which may expand or redefine a product category being distinct from existing portfolios. Lifecycles of breakthrough products are typically longer than those of line extensions. Consequently, the development of a breakthrough requires an intricate combination of technological expertise and an awareness of the not so obvious market needs. It may thus be suggested that also the current technology push for functional food development must optimally target the market pull for such breakthrough products.

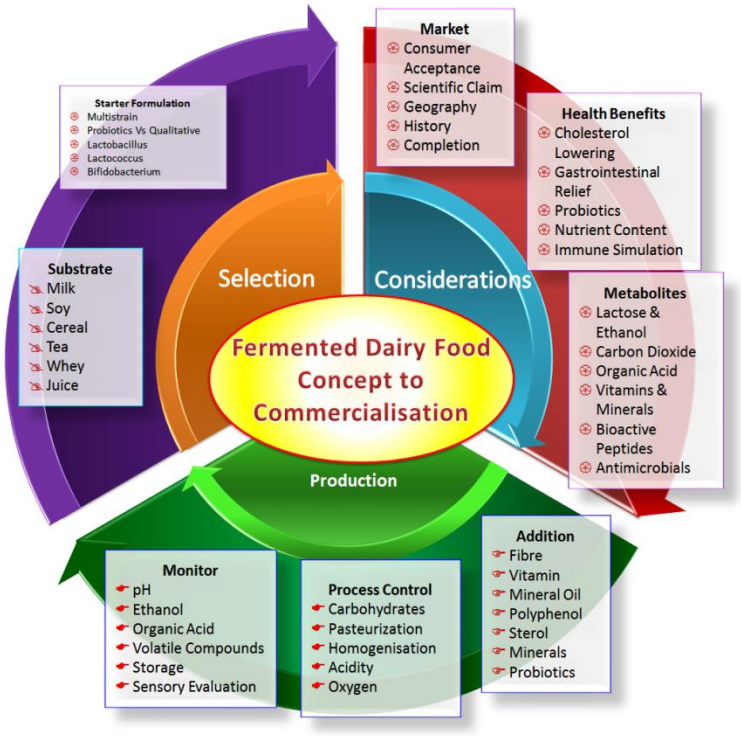

Fig 2: An overview of the interlinked processes and considerations in fermented Food development

The selection of appropriate starter strains is the key in efforts to accurately reproduce the desirable characteristics of traditional health-promoting fermented dairy products for mass production (Refer Fig.2). To faithfully reproduce these products and traits, microbes should be sourced from the traditional fermented dairy products, given that these microbes have adapted over thousands of years to their respective environments, and are more likely to function at the appropriate pH, salt concentration, temperature etc. Such populations also have a history of safe human consumption. Rational strain selection to produce the correct balance of flavour, aroma, texture, acidification, bitterness, speed of fermentation, and the optimum quantity of organic acid, vitamins and minerals is essential, as fermented products that are too sour or bitter, will not meet consumers approval. Over recent years, genetic tools have become available to engineer and select superior starter strains, but legislation currently hinders their industrial use. The inclusion of strains producing antimicrobials, such as bacteriocins, could serve as natural preservatives and

help produce a more natural product, while sequential fermentation with yeast, followed by bacteria, could produce a product with the desired physiochemical effects, but without biostabilisation issues created by excessive acidity development. As stated above, the natural fermentation of these products involves many different strains of bacteria, and sometimes, yeasts. There is an understandable tendency to keep starter formulations simple but, as traditional fermented product show, there are often multiple strains involved, including different species or even microorganisms. From a health perspective, multistrain or multispecies probiotic fermented products may provide greater beneficial effects than monostrain cultures. Unfortunately, however, there is a lack of studies assessing the effects of combining several natural strains on the physiochemical and sensory characteristics of milk or other fermented products. Without such information, it is difficult to accurately reproduce the characteristics of the organic fermented products with one produced by a defined combination of starters, to match the flavour and properties of the original. This is crucial when marketing fermented foods to consumers already familiar with the artisanally produced variant of the product, and if wishing to retain any health-promoting characteristics attributed to the original product. In spite of the wide range of options available when designing novel health-promoting fermented products, there will always be an attraction for healthy foods derived from natural processes. Applying the solid inoculation matrices of traditional fermented dairy products to new substrates provides a means of generating new fermented dairy products while retaining natural microbial populations. For example, kefir grains have been employed to produce whey and cocoa pulp beverages containing potentially health-promoting strains. Similarly, the cellulosic pellicle of kombucha has been successfully used to ferment milk and other substrates.

Novel Opportunity for exploitation of host-microbiome interactions :

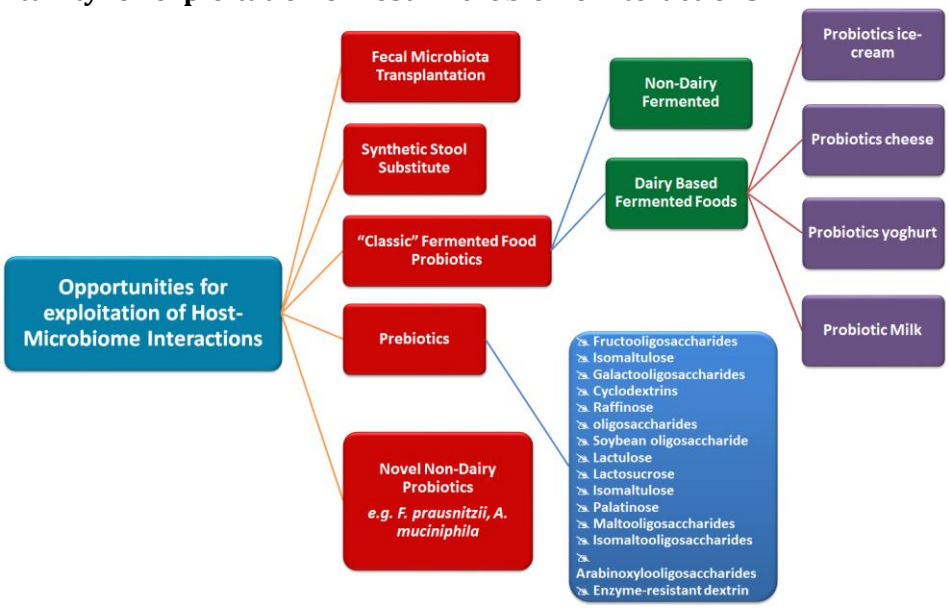

Fig 3: Different microbiota targeting strategies and their route toward exploitation

New sequencing technologies have dramatically increased our knowledge on the composition of the human intestinal microbiota in health and disease. In parallel, various omics as well as focused molecular studies have revealed novel insights in host–microbiome interactions at the cellular and molecular level (Refer Fig. 3). Although these studies are descriptive, advanced microbiota-targeting intervention strategies are being explored, ranging from the selection of novel probiotic strains and synthetic stool substitutes, toward the better monitoring of prebiotic and

dietary interventions. It can be envisaged that the efficacy of microbiota interventions will depend on the status of the microbiota of an individual at baseline, but also on genetic and physiological host parameters that determine the capacity to interact with microbes via specific receptors.

There is a wide range of functional foods that were developed recently and many of them are being produced in all over the world including probiotic, prebiotic and symbiotic foods. Fig. 4 enlists different types of prebiotic with their sources being used to incorporate in fermented dairy products. Prebiotics are short chain carbohydrates that are non-digestible by digestive enzymes in humans and selectively enhance the activity of some groups of beneficial bacteria. In the intestine, prebiotics are fermented by beneficial bacteria to produce short chain fatty acids. Prebiotics also render many other health benefits in the large intestine such as reduction of cancer risk and increase calcium and magnesium absorption. Prebiotics are found in several vegetables and fruits and are considered functional food components which present significant technological advantages. Their addition improves sensory characteristics such as taste and texture, and enhances the stability of foams, emulsions and mouth feel in a large range of food applications like fermented dairy products. Additionally, food application of bioactive prebiotics, stimulation of the viability of probiotics, health benefits, epidemiological studies, and safety concerns of prebiotics are being studied.

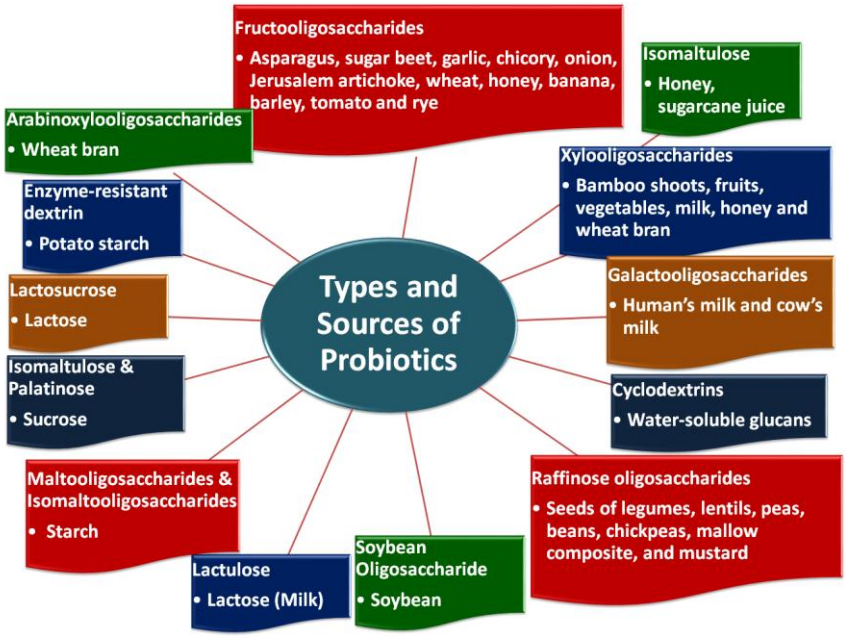

Fig 4: Types and Sources of Probiotics

Among these foods, probiotic functional foods are the first choice to exert positive effects on the human health. Probiotic functional foods were divided into dairy probiotic foods and non-dairy probiotic foods. Some of dairy probiotic foods including probiotic ice cream, frozen fermented dairy desserts, probiotic cheese, bioyoghurt, drinking yoghurt, kefir, Freeze-dried yoghurt and spray dried milk powder have been employed as possible delivery vehicles for probiotic bacteria. Probiotics are distinct as live micro-organisms which, when administered in sufficient amounts present a health benefit on the host according to Food and Agriculture Organization of United Nations; World Health Organization - FAO/WHO, 2002. *Lactobacillus* and *Bifidobacterium* are the most common probiotic bacterial cells that were used in the production of fermented and non-fermented dairy products. It must conform to certain requirements for a dairy food product to be considered as a valuable alternative for delivery of probiotic bacteria in one hand and for variety of probiotic cultures to use as a dietary adjunct and to exert a positive influence in the other hand. The

culture must be native of the human gastrointestinal tract, having the ability to ferment prebiotics, survives passage through the stomach and small bowel in adequate numbers, be capable of colonizing in site of action, and have beneficial effects on human health (Refer Fig.5). In order to survive, the strain must be resistant to acidic conditions (gastric pH 1-4), alkaline conditions (bile salts present in the small bowel), enzymes present in the intestine (lysozyme) and toxic metabolites produced during digestion. In the case of dairy food product to be considered as a valuable alternative for delivery of probiotics, it must to match definite necessities such as neutral pH, high enough total solids level, absence of oxygen and near to ambient temperatures. Fig. 5 shows some key clinical effects of probiotic and yoghurt strains.

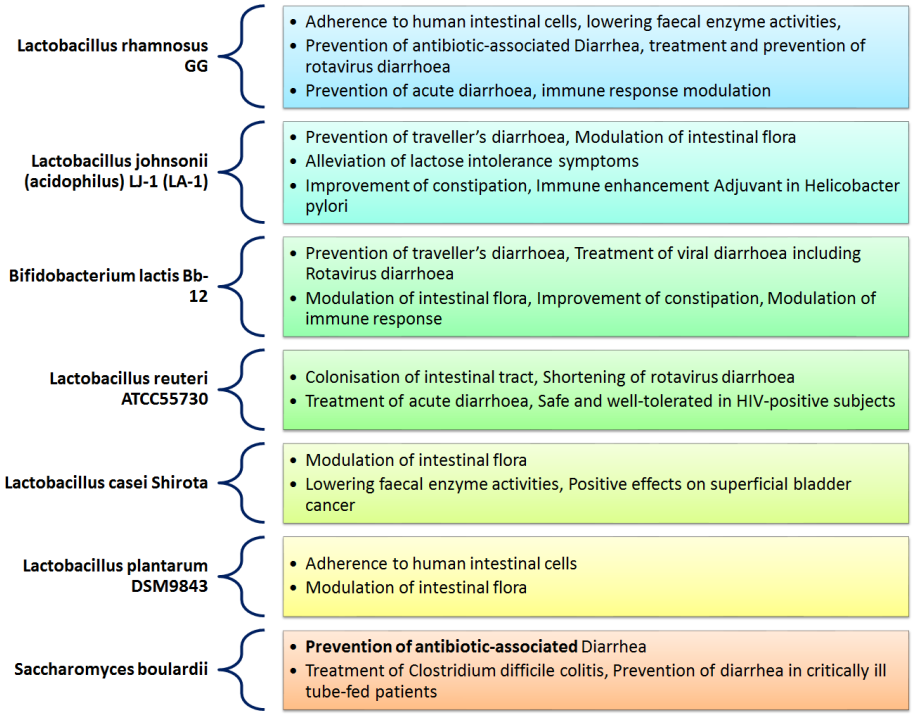

Fig 5: Clinical effects of some probiotic strains and yoghurt strains

Dairy Probiotic Foods:

As mentioned before, dairy functional foods beyond its basic nutritional value has physiological benefits. In fermentation process, acids such as lactic acid, acetic acid and citric acid are naturally produced. These acids enhance organoleptic qualities as well as safety of food products. Lactic acid bacteria are found to be more tolerant to acidity and organic acids than most of the pathogens and spoilage microorganisms. Some fermented dairy products with detailed consideration are discussed as follows.

1. Probiotic ice cream

Probiotic ice cream is produced by incorporation of probiotic bacteria in both of fermented and unfermented mix. *Lactobacillus* and *Bifidobacterium* are the most common species of lactic acid bacteria used as probiotics for fermented dairy products. The pH of non-fermented ice cream is near to seven which is providing to survive probiotic bacteria. The high total solids level in ice cream including the fat and milk solids provides protection for the probiotic bacteria. Because the efficiency of added probiotic bacteria depends on dose level, type of dairy foods, presence of air and low temperature, their viability must be maintained throughout the product's shelf-life and they must survive the gut environment. The therapeutic value of live probiotic bacteria is more than unviable cells; therefore, International Dairy Federation (IDF) recommends that a minimum of 10^7

probiotic bacterial cells should be alive at consumption time per gram per mililiter of product. Studies indicate, the bacteria may not survive in high enough numbers when incorporated into frozen dairy products unless a suitable method is used against freeze injury and oxygen toxicity. The physical protection of probiotics by microencapsulation is a new method for increasing the survival of probiotics. *Lactobacillus casei* (Lc01) and *Bifidobacterium lactis* (Bb12) have the highest resistance to simulated acidic, alkaline and ice cream conditions in comparison with other probiotic strains, making them suitable probiotic strains for use in probiotic ice cream.

2. Probiotic cheese

There are two ways for development of probiotic cheese: in the first step, the manufacture processes of cheese products have to be modified and adapted to the requirements of probiotics and in second step, appropriate probiotic strains to be applied or new cheese products have to be developed. The proteolytic and lipolytic properties of the probiotic bacterial cells have important effects on taste and flavour of the probiotic cheese. Antagonism between bacteria is often based on the production of metabolites that inhibit or inactivate more or less specifically other related starter organisms or even unrelated bacteria. Cheese provides a valuable vehicle for probiotic delivery, due to creation of a buffer against the high acidic environment in the gastrointestinal tract, and thus creates a more favourable environment for probiotic survival throughout the gastric transit, ought to higher pH. The presence of the prebiotics inulin and oligofructose can promote growth rates of *bifidobacteria* and lactobacilli, besides increased lactate and short chain fatty acids production in petit-suisse cheese.

3. Probiotic yoghurt

The conventional yoghurt starter bacteria, *L. bulgaricus* and *Streptococcus thermophilus*, do not have ability to survive passage through intestinal tract and consequently so, they are not considered as probiotics. But the addition of *L. acidophilus* and *B. bifidum* into yoghurt can add extra nutritional and physiological values. Heat treated homogenized milk with an increased protein content (3.6–3.8%) is inoculated with the conventional starter culture at 45°C or 37°C and incubated for 3.5 and 9 h, respectively. The probiotic culture is added prior to fermentation simultaneously with the conventional yoghurt cultures or after fermentation to cooled (4°C) product before packaging. The survival of probiotic bacteria in fermented dairy products depends on the chemical composition of the fermentation medium (e.g. carbohydrate source), final acidity, milk solids content, availability of nutrients, growth promoters and inhibitors, strains used, interaction between species present, culture conditions, concentration of sugars (osmotic pressure), dissolved oxygen (especially for *Bifidobacterium spp*.), level of inoculation, incubation temperature, fermentation time and storage temperature. The 'overacidification' is prevented to a limited extent by applying 'good manufacturing practice' and by using cultures with reduced 'overacidification' behaviour. The inhibition of bifidobacteria in probiotic yoghurt is due to antagonism effects among starter bacteria rather than hydrogen peroxide or organic acids. The ideal procedure for probiotic yoghurt manufacturing is growing the *Bifidobacterium* spp. separately, followed by washing out of free metabolites and the transfer of the cells to the probiotic yoghurt. Oxygen toxicity is a critical problem for *Bifidobacterium* spp. because they are strictly anaerobic. Low initial oxygen content in milk provides the low redox potential required in the early phase of incubation to guarantee Bifidobacteria growth. Oxygen easily dissolves in milk during yoghurt production and also permeates through packages during storage. It has been suggested to inoculate *S. thermophilus* and *Bifidobacterium* simultaneously during fermentation to avoid the oxygen toxicity problem. *S. thermophilus* has a high oxygen utilization ability, which results in reduction of dissolved oxygen in probiotic yoghurt and an enhancement in viability of bifidobacteria.

4. Probiotic milk

Acidophilus milk production, the milk is heated at 95°C for 1 h or at 125°C for 15 min. Such a high heat treatment stimulates the growth of *Lactobacillus acidophilus* by providing denatured proteins and released peptides. High-heat-treated milk is cooled to 37°C and kept at this temperature for a period of 3-4 h to allow any spores present to germinate. Then, milk is re-sterilized to destroy almost all vegetative cells. Unless skim milk is used, the heat-treated milk is homogenized and cooled down to inoculation temperature (37°C). *Lactobacillus acidophilus* is added as active bulk culture. The level of inoculation is usually 2-5% and the inoculated milk is left to ferment until pH 5.5-6.0 or ~1.0% lactic acid is obtained, with no alcohol. The fermentation takes about 18-24 h under inactive conditions. After the fermentation, the number of viable *Lactobacillus acidophilus* colonies is about $2\text{-}3\times10^9$ cfu mL-1, but this number decreases up to consumption time. Following fermentation, the warm product is rapidly cooled to <7°C before agitation and pumped to a filler where it is filled into bottles or cartons. Acidophilus milk has higher free amino acids than milk. As the milk lactose is hydrolyzed by β-galactosidase of Lactobacillus acidophilus, acidophilus milk is more suitable for individuals suffering from lactose intolerance. Acidophilus milk is enriched with calcium, iron and vitamins. Technology of bifidus milk and acidophilus-bifidus milk manufacturing is similar to acidophilus milk.

Nutritional Benefits of Fermented Dairy Products:

The following describes some of the key health benefits of consumption of fermented probiotic dairy products.

1. Alleviation of Lactose Intolerance

The inability of adults to digest lactose, or milk sugar, is prevalent worldwide. Consumption of lactose by those lacking adequate levels of lactase produced in the small intestine can result in symptoms of diarrhea, bloating, abdominal pain and flatulence. Milk with cells of *L. acidophilus* aids digestion of lactose by such persons. Yoghurt was found to be helpful in the digestion of lactose because the lactic acid bacteria used to make yoghurt produce lactase and digest the lactose.

2. Protection against Gastrointestinal Infection

Viable lactic acid bacteria interfere with the colonization and subsequent proliferation of food borne pathogens, thus preventing the manifestation of infection. *L. bulgaricus, L. acidophilus, S. thermophilus and B. bifidum* have been implicated in this effect. The beneficial effects of lactic acid bacteria and cultured milk products have also been attributed to their ability to suppress the growth of pathogens either directly or through production of antibacterial substances. Replenishing the flora with normal bacteria during and after antibiotic therapy seems to minimize disruptive effects of antibiotic use. Probiotics have been reported to effective in prevention of various gastrointestinal infections, rotavirus infection, traveler's diarrhea & antibiotic induced diarrhea.

3. Anti-carcinogenic Effect

Yoghurt and milk fermented with *L. acidophilus* have been reported to have Anti-carcinogenic effects. Different potential mechanisms by which lactic acid bacteria exert antitumor effects have been suggested such as changes in faecal enzymes thought to be involved in colon carcinogenesis, cellular uptake of mutagenic compounds, reducing the mutagenicity of chemical mutagens and suppression of tumors by improved immune response.

4. Immune System Stimulation

The immune system provides the primary defense against microbial pathogens that have entered our bodies. The immunostimulatory effect of yoghurt is due to its bacterial components. Cytokine

production, phagocytic activity, antibody production, T-cell production etc. are increased with yoghurt consumption or with lactic acid bacteria.

5. Lowering of Serum Cholesterol

Fermented milk products show hypocholesteraemic effect. Intake of large quantities of fermented milk furnishes factors that impair the synthesis of cholesterol. *L. acidophilus* has exhibited the ability to lower serum cholesterol levels.

6. Alleviation of Constipation

Constipation is common problem in subjects consuming the western diet and also in elderly people. Fermented Dairy products containing *lactobacillus* (*L. acidophilus NCDO 1748, L. casei Shirota and Lactobacillus GG)* preparation and fermented milks shows alleviation of constipation.

7. Antihypertensive Activity

Casein hydrolysate, produced by an extracellular proteinase from *L. helveticus* (CP790) has antihypertensive activity. Two antihypertensive peptides have been purified from sour milk fermented with *L. helveticus* and *Saccharomyces cerevisiae*. These two peptides inhibit angiotensin-converting enzyme that converts angiotensinogen-1 to angiotensinogen-2, which is a potent vasoconstrictor. Consumption of certain *lactobacilli*, or products made from them, may reduce blood pressure in mildly hypertensive people.

8. Antiallergenic Qualities

Probiotics help to prevent allergic reactions in individuals at high risk of allergies, such as food allergies. Probiotic bacteria help to reinforce the barrier function of the intestinal wall, thereby preventing the absorption of some antigens.

9. Functional Bio-peptides

Fermented produce are a source of bioactive peptides, released through fermentation by proteolysis cultures, and linked with many potential health benefits including digestive, endocrine, cardiovascular, immune and nervous system affects.

10. Improved detoxification

The presence of glucuronic acid, one of the primary metabolites in kombucha, is believed to improve detoxification by binding toxin molecules and aiding excretion through the kidneys and it is this acidic composition that is most associated with the reputed health properties of kombucha, rather than a microbial-gut interaction.

Emerging Trends for Fermented Dairy Products:

The global functional beverage market is a growing sector of the food industry as modern health-conscious consumers show an increasing desire for foods that can improve well-being and reduce the risk of disease. The development of functional probiotic foods is increasing, as their market increases day by day, although the consumer's information about these foods is increasing without relation to gender, age, and educational or economic levels of the consumers. The therapeutically effect of a functional probiotic food may depend on the consumer’s characteristics and the type of carrier and enrichment considered.

Cultured dairy products have been providing vital importance in the human diet. However, this segment is having some challenges such as :

1. Careful selection of specific strains combined with proper production and handling procedures will be necessary to ensure that desired benefits are provided to consumers.
2. Most suitable candidate organism for fermentation, select different protective and carrier media, evolve a suitable technology to design foods which contain and maintain large populations of viable bio-active organisms during processing and post harvest processing periods and have longer shelf life.
3. There needs to be a consensus with respect to what constitutes the natural microbiota of specific fermented dairy product, a description of which are essential for fermentation, and the contribution of each microbe to the final composition.
4. Characterization of the relationship between microorganisms, particularly between bacterial and yeast populations. The influence of containers, substrates, metabolites and enhancements on the organoleptic qualities and fermentation kinetics need to be evaluated.
5. Increasing pressure to identify and confirm proposed health claims for the consumer.
6. Considering the costs of development and clinical trials, innovation in the functional food market may need to become a collaborative effort between industry partners and academia.
7. The obvious hurdle is consumers' willingness to accept an unfamiliar product, with optimum nutrition and flavour development. It has been shown that taste, price and base nutritional composition are more important than functional properties.
8. Study the mechanisms of action of probiotics and prebiotics in the GI tract, and develop diagnostic tools and biomarkers for their assessment
9. To evaluate the role of immunological biomarkers and probiotic applications thereof
10. To study GI diseases, GI infections and allergies in different population groups
11. To address trade-offs, and to ensure the stability and viability of probiotic product.

Some emerging markets for Fermented Dairy Products are as follows:

- Food service institutional market: It is growing at double the rate of consumer market
- Defense market: An important growing market for quality products at reasonable prices
- Ingredients market: A boom is forecast in the market of dairy products used as raw material in pharmaceutical and allied industries
- Parlour market: The increasing away-from-home consumption trend opens new vistas for ready-to-serve dairy products which would ride piggyback on the fast food revolution sweeping the urban India.

(References would be provided upon request).

Regulatory Forum: Dr. J. I. Lewis, Chairman, Regulatory Affairs, PFNDAI

The Ministry of Health and Family Welfare has constituted a Committee to review the Act, rules and regulations. A timeframe of 45 days from its first meeting (9th January) has been provided for completion. The reasons mentioned in the order for the review is weak and expectedly on account of factors unrelated to the Act. A previous attempt to seek amendments, but now withdrawn were typically towards leveraging more control rather than removing misconstructions that hampered business and trade.

Industry appreciates that the Act represents the best in class modern food control system practiced internationally. It is therefore our position that fundamental to the review is acknowledgement that Parliament intended to replace the adulteration framework with a risk framework (modern science based Act). Basically the wrong framework is continuing under the Act that has caused much anxiety and unpredictability in trade and enforcement. PFNDAI have therefore suggested amendments that augment and clarify principles.

The key points made in our submission are:

1. Amending Sections 13-15, which relates to the selection, working and procedures of the Scientific Panels and Scientific Committee. Nowhere in the Act is a hierarchical role of the Committee over the Panels provided – the current bureaucratic practice results in prolonged process.
2. The major amendments sought are in relation to Sections18. It should be noted that sections 19 through 23 relate to authorizations being required for foods, ingredients and substances either added or present in foods to comply with safety provisions. Hence Section 18 is to be modified to require premarket approvals for novel and GM foods/ingredients only.
3. Therefore all other foods mentioned therein namely proprietary foods, food supplements, and foods for special dietary uses are typical definitions (muddled up) – to be removed from the ambit of Section 22 and placed in Section 3 (Definitions) with clear definitions. Premarket approvals are not done for products – they are done only for foods or ingredients
4. The reference to RDA should be substituted by the term "Upper Safe Levels". RDA as the reference point for maximum limits in foods is contrary to the fundamental principle of a science based Act. The determination of maximum levels added to foods and food supplements is a risk management exercise and typically should appear in Section 18 – which deals with the principles of making regulations based on risk assessment.

5. Greater transparency by ensuring public access to agendas and minutes of the Scientific Committee and Panels is required.

It is further our view that a thorough understanding of the Act should be undertaken before any amendments are finalized. Amendments should only be considered after a determination is made that the Act is either deficient or unclear and not because of misinterpretation or incompatible processes.

PFNDAI has requested co-option to the Committee as well as the opportunity to be heard.

Research in Health & Nutrition

Prebiotics may help ease anxiety
A study published in *Psychopharmacology* shows that a prebiotic—trans-galactooligosaccharide—may help reduce anxiety and stress in healthy subjects. In the study, 45 subjects received either one of two prebiotics (fructooligosaccharides [FOS] or *Bimuno*-galactooligosaccharides [B-GOS]) or a placebo for 3 weeks.

The salivary cortisol awakening response (CAR) was sampled before and after prebiotic/placebo administration to assess hypothalamic-pituitary-adrenal (HPA) axis activity. The HPA axis is often dysregulated in individuals suffering from depression and anxiety impacting affective and memory processing as well as having strong directional links with the gut microbiome. On the final day of treatment participants completed a computerized task battery assessing the processing of emotionally salient information.

The researchers found that the consumption of B-GOS produced a decrease in both waking cortisol levels and attentional vigilance towards negative versus positive information. The results suggest that B-GOS may have an anxiolytic effect and reduce stress reactivity in healthy subjects. The study also demonstrates that manipulation of the gut microbiota with B-GOS may alter HPA axis reactivity and processing.

The study revealed decreased attentional vigilance to negative versus positive information after B-GOS treatment, compared to placebo and FOS treatment. Increased processing of negative material is seen as a core functional marker of anxiety and depression and can be modulated by antidepressant/anxiolytic medication. No effects were found after administration of a FOS prebiotic.

Further trials are planned to study the effects of B-GOS on individuals suffering from anxiety, stress, or depression

IFT Weekly December 10, 2014
❁❁❁

Yogurt may lower type 2 diabetes risk
A study published in *BMC Medicine* shows that yogurt may help lower the risk for type 2 diabetes. However, in the study other forms of dairy like milk and cheese, did not offer the same kind of protection as yogurt for diabetes risk.

The study examined data from 41,497 participants from the Health Professionals' Follow-up Study, which included male dentists, pharmacists, veterinarians, osteopathic physicians, and podiatrists; 67,138 from the Nurses' Health Study; and 85,884 from Nurses' Health Study II. Participants were queried every two years about their dietary habits and followed for up to 30 years to determine their health outcomes.

More than 15,000 of the three studies' participants developed diabetes over the years. There was no correlation between dairy consumption and diabetes risk—with one exception: yogurt was linked to a significantly lower risk of diabetes. And this was true even after controlling for factors known to be linked to diabetes like body mass index (BMI) and diet. The researchers then pulled in data from previous studies to add to theirs, and calculated that 28 g of yogurt per day was linked to an 18% lower risk of type 2 diabetes.

While the link between yogurt and lower type 2 diabetes risk isn't understood yet, the researchers have hypothesized that the probiotics found in yogurt may help to improve insulin sensitivity and reduce inflammation. This hypothesis needs to be tested in randomized clinical trials.

IFT Weekly December 17, 2014
❁❁❁

Change of diet to unmask cancer vulnerabilities, reduce cancer risk

Science Daily December 18, 2014

Many recent studies showed that calorie restrictions reduce the incidence of cancer, whereas high-calorie diets cause obesity and diabetes, both of which increase the risk of developing cancers. However, tumour biology still hides complex mechanisms, as revealed by researchers from the Faculty of Medicine of the University of Geneva (UNIGE), Switzerland. In a study published in Cell Metabolism, scientists not only found the unexpected benefit that a change of diet had on certain types of lung cancer, they also deciphered the molecular mechanism underlying this dietary effect and showed how this cancer vulnerability could be exploited in targeted treatment strategies with limited side effects.

Unlike tumours caused by other oncogenes, KRAS-driven tumours, an oncogenic mutation common in lung, pancreas and colon cancers, are known to be sensitive to dietary restrictions. Although the effect of calorie restriction on these tumours is widely studied, Professor Roberto Coppari and his team from the Department of Cell Physiology and Metabolism at UNIGE's Faculty of Medicine, with colleagues from the University of Texas Southwestern Medical Centre and from the Ancona University, decided to explore what would the outcomes of a change of diet be (from low to high-calorie diet). Surprisingly, they discovered that a high-calorie diet could have a potent anti-tumour action if the switch of diet took place before the tumour onset. Conversely, a high-calorie diet started after the tumour onset fuelled tumour growth and worsened prognosis. The fact that the moment of dietary change is crucial indicates that this effect is not due to the diet per se but to the metabolic changes it engenders. "Our study does not show that, by eating junk food, people would be protected from lung cancer. But the high-calorie diet helped us discover a very specific molecular mechanism required for lung tumour cells to proliferate that could pave the way for new therapeutic approaches," underlines Giorgio Ramadori, the study's co-first author with Georgia Konstantinidou.

A matter of thresholds

In normally functioning cells, a particular kind of molecules -- called chaperones -- helps proteins to fold and function properly. However, in case of protein overload, chaperone expression increases, with the goal of reducing the likelihood of proteins being unable to function correctly. In the endoplasmic reticulum (the part of the cells that allows proteins to be properly sorted), when protein overload is achieved, endoplasmic reticulum stress (ER stress) occurs, which involves an increased chaperone expression. When this stress is too high, however, cells cannot cope with it and die. In tumors, the ER stress threshold is different and, in some cases, it seems higher, which constitutes a possible explanation for the fact that they do not die, but can proliferate abnormally even in these circumstances.

The scientists discovered that the dietary change was actually a way to trigger a raise in the ER stress. Indeed, if the ER stress threshold is raised before the tumour onset, the sick cells do not have the ability to trigger an effective response and tumour progression is hampered. However, if the change took place after the tumour appeared, tumour cells already resolved a good part of ER stress and the additional stress may actually fuel the proliferation phenomenon.

A potential cancer treatment with limited side effects

Reducing side effects is a major goal for achieving improved cancer therapy, as quite often treatment kills indiscriminately sick and healthy cells alike. By undertaking transcriptome analyses of lung tumours from the different dietary groups, the scientists identified a specific chaperone protein, FKBP10, of which expression was greatly reduced by a switch to a high-calorie diet. This protein was expressed in human lung cancer cells but not in the healthy ones. Very interestingly, this same protein is usually expressed during the embryonic development and early age, but not in adults (in mice and most likely in human beings). When the embryo is developing, it induces an important ER stress, which is resolved, in part, by these chaperones. After the development phase, the ER stress diminishes greatly. Hence, several chaperones, including FKBP10, are not

needed any longer and stop being expressed; tumours, however, reactivate the expression of the FKBP10 protein, probably to cope with their ER stress. An inhibitor to FKBP10 would therefore act as a therapeutic agent able to selectively hinder cancer cell proliferation while sparing healthy lung.

"FKBP10 was not previously thought to be important for cancerous cells. In this study we show that knock-down of FKBP10 leads to reduced cancer growth. Human lung cancer cells express FKBP10 while the nearby healthy lung tissue does not; this is very interesting and appealing to eventually translate these findings to the clinical arena. Hence, if we manage to identify the right inhibitor, we may open the door to new therapeutic strategies that will be able to hinder cancer cells proliferation without damaging the healthy cells. The inhibition of this protein is predicted to have minimal side effects as it is not expressed in healthy tissues, at least in adulthood," concludes Roberto Coppari, who estimates that, if preclinical data support such expectation, clinical trials could start in a few years' time.

❁❁❁

Malnutrition a hidden epidemic among elders

Science Daily December 18, 2014

Health care systems and providers are not attuned to older adults' malnutrition risk, and ignoring malnutrition exacts a toll on hospitals, patients, and payers, according to the latest issue of the What's Hot newsletter from The Gerontological Society of America (GSA).

Under the title "Aging Policy: Preventing and Treating Malnutrition to Improve Health and Reduce Costs," the new instalment points out that aging is a risk factor for malnutrition and highlights opportunities to improve nutrition awareness, interventions, and policy priorities.

Support for the publication was provided by Abbott. GSA member Connie Bales, PhD, RD, of the Duke University School of Medicine and Robert Blancato, MPA, of Matz, Blancato & Associates, Inc., served as faculty advisers.

"This issue of *What's Hot* points to a growing but still unaddressed epidemic of malnutrition -- especially among older adults," said Blancato, who heads the National Association of Nutrition and Aging Services Programs. "It makes a strong case for modest but important changes in current laws which can address malnutrition and achieve the dual desirable goals of improving health and reducing health care costs."

Bales, a convener of GSA's Nutrition Interest Group, said the new publication aligns with GSA's mission by expanding scientific knowledge in aging and fostering application of research in the development of public policy.

"The newsletter raises awareness of the nutritional challenges faced by older adults and advocates for applying the existing science to current and future policies that will help improve their nutritional status," she said.

The *What's Hot* states that malnutrition cuts across all weight categories, from underweight to obese. An estimated one-third to one-half of U.S. adults are malnourished or at risk for malnourishment upon admission to the hospital -- and longer hospital stays are associated with worsening nutritional status.

Additionally, about half of older adults in rehabilitation settings are malnourished. Yet only about one-quarter of U.S. medical schools provide at least 25 hours of nutrition instruction for medical students, as recommended by the National Academy of Sciences.

But as the issue points out, there are a range of possible policy interventions that can help mitigate the problem -- enhancing the health and quality of life for older adults while simultaneously reducing healthcare costs. The upcoming reauthorization of the Older Americans Act, for example, could be a key opportunity to expand access to malnutrition services and support.

"Modest changes in current laws such as greater utilization of registered dieticians, nutrition screening, and counselling in the Older Americans Act; greater focus on nutrition in care transition grants under the Affordable Care Act; and coverage for oral nutrition supplements for at risk older adults should all be on the agenda for the new Congress," Blancato said. "GSA and its publication make the point that good nutrition throughout the lifespan is the personification of prevention."

❁❁❁

Healthy eaters: Ignore glycemic index, scientists say

Science Daily December 16, 2014

Good news for people who are already following a diet rich in fruits, vegetables and whole grains, and low in sweets: New research suggests these heart-healthy eaters don't need to worry about choosing low glycemic index foods to lower the risk of diabetes and heart disease. Though the study was not designed to test the effects of low glycemic index foods on weight control, its lead researchers looked at studies that did focus on weight and found no clear proof of a benefit.

The glycemic index is a measure of how quickly foods containing carbohydrates, such as fruits, cereals and baked goods, raise glucose levels in the bloodstream. Conventional wisdom says that high glycemic index foods like bananas and pasta are "bad" for heart health and may increase diabetes risk. But in a clinical trial reported Dec. 17 in the *Journal of the American Medical Association*, researchers at the Johns Hopkins University School of Medicine and Harvard Medical School found little evidence to support these claims.

Study volunteers followed carefully planned diets high or low in carbohydrates and with high or low glycemic index scores. Tests tracked the volunteers' blood pressure, cholesterol levels and sensitivity to insulin at the beginning and end of each diet. The results showed little difference between high and low glycemic index foods, says study co-director Lawrence J. Appel, M.D., M.P.H., a professor of medicine and director of the Welch Center for Prevention, Epidemiology and Clinical Research at Johns Hopkins Medicine.

"We were really surprised," Appel says. "We did not detect any clear benefit of the low glycemic index diets on the major risk factors for heart disease, and we found no evidence of benefit for diabetes prevention."

The authors looked closely at other studies focusing on the use of low glycemic index foods in weight control. "The evidence has been inconsistent that low glycemic foods help people lose more weight or keep it off," Appel says. "In looking at the causes of obesity and ways to combat it, a narrow focus on the glycemic index seems to be unwarranted."

Several popular diets recommend choosing carbohydrates that score low on the glycemic index, but that's not always easy. Only laboratory tests can determine a food's glycemic index, and the results can be unexpected: Apples score low, but cantaloupe scores high.

Appel and study co-director Frank M. Sacks, M.D., a professor of medicine at Harvard Medical School, wanted to find out whether foods' glycemic index matters to heart health and diabetes prevention. They recruited 163 volunteers from Baltimore and Boston -- all of whom were overweight and had above normal blood pressure -- and randomly assigned them to follow one of four diets. Each diet contained the same number of calories, but those calories came from foods that were either high or low in carbohydrates, and also either

high or low on the glycemic index. The volunteers ate the day's main meal at a research center and took home their next two meals.

After five weeks on their assigned diets, the volunteers switched to a different one. Researchers tested the volunteers' blood pressure; sensitivity to insulin; and levels of "good" high-density lipoprotein (HDL) cholesterol, "bad" low-density lipoprotein (LDL) cholesterol and triglycerides -- fat molecules, or lipids, that play a role in heart health. The low glycemic index diets did not lower blood pressure or LDL cholesterol, and they did not improve insulin resistance.

Women made up 51 percent of the study's volunteers, and African-Americans made up 52 percent, so the results have broad relevance, says Appel, who offers simple advice for anyone overwhelmed by conflicting messages about diet and health.

"Get back to the basics that most people already know," he says. "Don't drink sugar-sweetened drinks. Try to eat fruits, vegetables and whole grains. Try to avoid sweets, salt, and foods high in saturated and trans fats. People who follow these principles will reap the benefits."

Appel and Sacks led three earlier clinical trials that tested ways to reduce the risk of cardiovascular disease and diabetes, providing volunteers with carefully designed diets and measuring the effects on key health indicators. Their work established the health benefits of the DASH (Dietary Approaches to Stop Hypertension) and OmniHeart Mediterranean-style diets.

❁❁❁

Boosting chemical by-product of dietary fibre fermentation in gut slims and trims

Science Daily December 10, 2014

This approach may offer a new weight management option, suggest the researchers. Animal studies have shown that the natural fermentation of dietary fibre by gut bacteria produces short chain fatty acids, one of which is propionate. These fatty acids stimulate the release of the gut hormones PYY and GLP-1, which in turn suppress appetite. And propionate seems to be the most effective at stimulating PYY and GLP-1 release.

To find out if increasing levels of propionate in the bowel could reduce food intake and stave off weight gain in people, the researchers developed a propionate supplement primed to target propionate release in the bowel. First, 20 volunteers were given either the propionate supplement or just inulin, a predominantly fructose-containing plant fibre, and allowed to eat as much as they liked from a buffet. When given the propionate supplement, participants ate 14% less, on average, and had higher levels of PYY and GLP-1 in their blood.

Next, 60 overweight adults between the ages of 40 and 65 received either a daily 10 g dose of the propionate supplement or 10 g of inulin alone over a period of 24 weeks. They were asked to follow their normal dietary and exercise routines throughout. Body weight was assessed at the beginning and end of the study period, as was the distribution of fat around the body.

A fasting blood sample was also taken to check on risk factors for cardiovascular disease and diabetes, including blood fats, liver enzymes, and markers of inflammation. Forty nine of the original 60 participants completed the trial. Among the 25 people taking the propionate supplement, just one put on more than 3% of their baseline weight, compared with six of the 24 treated with inulin alone. Furthermore, the propionate supplement altered the distribution of body fat, significantly trimming abdominal fat tissue compared with inulin alone, and lowering the total amount of fat in the liver.

Both the propionate supplement and inulin cut the risk factors for cardiovascular disease and diabetes, although only the propionate supplement significantly reduced 'bad' low density cholesterol and the enzyme aspartate transaminase, high levels of which are associated with tissue damage, particularly of the heart and liver.

The evidence suggests that adults gain around half to 1 kilo in weight every year throughout middle age by just consuming 50-100 extra calories a day. And the findings provide the first direct evidence that raising propionate levels in the bowel can cut energy intake and stave off longer term weight gain, say the researchers.

"The present results support a role specifically for colonic propionate in weight management and may provide a molecular explanation of recent data that have observed changes in the gut [range of bacteria] and associated [short chain fatty acid production] profiles in weight loss," they conclude.

❁❁❁

Each dollar spent on kids' nutrition can yield more than $100 later

Science Daily December 8, 2014

There are strong economic incentives for governments to invest in early childhood nutrition, reports a new paper from the University of Waterloo and Cornell University. Published for the Copenhagen Consensus Centre, the paper reveals that every dollar spent on nutrition during the first 1,000 days of a child's life can provide a country up to $166 in future earnings.

"The returns on investments in nutrition have high benefit-cost ratios, especially in countries with higher income levels and a growing economy," said Professor Susan Horton, of the School of Public Health and Health Systems and the Department of Economics at Waterloo.

Children who are undernourished during the first 1,000 days of their lives typically show stunted growth patterns by the age of three and have poorer cognitive skills than their well-fed peers. As adults they are less educated, earn lower wages and have more health problems throughout their lives.

"Height-for-age is a much better measure of health than weight-for-age. It is also predictive of economic outcomes," said Professor Horton, also chair in global health economics at the Centre for International Governance Innovation. She analyzed height and income data from a longitudinal nutrition study from Guatemala for the report. "Good childhood nutrition produces people who can contribute more and help boost economic growth."

Studies of a range of low- and middle-income countries suggest that 1 cm more of adult height for men is associated with an increase in their earnings of 2.4 per cent.

"Over an adult's working life, we can expect that one dollar spent on early childhood nutrition will on average have $45 worth of benefits in low- and middle-income countries," said Horton.

The paper looked at the effects of stunting on low and middle-income countries such as Ethiopia, Kenya, Yemen and India. The cost-benefit ratio was the greatest in Indonesia, where every dollar spent on early childhood nutrition could provide the country $166 in future earnings.

"It really is a compelling economic argument for nutrition interventions," said Horton. "If we can reduce stunting through better early nutrition, we can improve quality of life not only for individuals, but nations as a whole."

Currently, the World Health Organization is aiming to reduce stunting among children under age five by 40 per cent as part of its 2025 nutrition goals, and it is widely expected that the rate of stunting will also be included in its Sustainable Development Goals, which will be announced in 2015.

❁❁❁

Natural substance in red wine has an anti-inflammatory effect in cardiovascular diseases

Science Daily December 4, 2014

Researchers see great therapeutic potential in the natural substance resveratrol, particularly in connection with prevention of the synthesis of inflammatory factors in cardiovascular diseases.
Credit: photo/©: Peter Pulkowski, Mainz University Medical Center

A natural substance present in red wine, resveratrol, inhibits the formation of inflammatory factors that trigger cardiovascular diseases. This has been established by a research team at the Department of Pharmacology of the University Medical Center of Johannes Gutenberg University of Mainz (JGU) working in collaboration with researchers of the Friedrich Schiller University in Jena and the University of Vienna. Their results have recently been published in the scientific journal Nucleic Acids Research.

Despite the fact that they eat more fatty foods, the French tend to less frequently develop cardiac diseases than Germans. This so-called French Paradox is attributed to the higher consumption of red wine in France and it has already been the subject of various studies in the past. A number of research projects have actually demonstrated that the natural product resveratrol, present in red wine, has a protective effect against cardiovascular diseases. But what exactly is the reason for this? It seems that at least part of the protective effect can be explained by the fact that resveratrol inhibits the formation of inflammatory factors, a conclusion reached by the research team of Junior Professor Andrea Pautz and Professor Hartmut Kleinert of the Mainz University Medical Center following collaboration in a joint project with Professor Oliver Werz of the Friedrich Schiller University in Jena and Professor Verena Dirsch of the University of Vienna. In fact, the researchers discovered that the natural substance binds to the regulator protein KSRP and activates it. KSRP reduces the stability of messenger RNA (mRNA) in connection with a number of inflammatory mediators and thus inhibits their synthesis.

"We now know more precisely how resveratrol inhibits the formation of the inflammatory factors that trigger cardiovascular diseases. This is an important finding in view of the fact that more recent research has shown that cardiovascular diseases are significantly promoted by inflammatory processes in the body," said Pautz. Cardiovascular disorders, such as myocardial infarction and strokes, frequently occur in association with chronic inflammatory diseases, such as arthritis. The natural substance resveratrol thus has major therapeutic potential, particularly when it comes to the treatment of inflammatory diseases that can cause serious damage to the cardiovascular system.

❁❁❁

Eating more green vegetables may aid heart health, reduce risk of obesity, diabetes

7 December 2014 Medical News Today
"Eat your greens, they're good for you." This is statement that many of us heard as a child while pushing vegetables around the plate in disgust at dinner time. But it seems our parents may have had a point; three new studies reveal that a chemical called nitrate - found in green vegetables including spinach, lettuce and celery - may aid heart health and reduce the risk of obesity and diabetes.

The three studies were conducted by researchers from the University of Cambridge and the University of Southampton - both in the UK. In the first study, co-led by Dr. Andrew Murray from the University of Cambridge and published in *The FASEB Journal*, researchers found that eating more vegetables rich in nitrate may reduce production of a hormone made by the liver and kidneys, called erythropoietin. This hormone regulates the number of red blood cells in the body. The team explains that at high altitudes or in cardiovascular diseases, the body is subject to a shortage of oxygen. In order to get more oxygen around the body, erythropoietin increases its production of blood cells.

However, high numbers of blood cells can cause the blood to become too thick. This means that the body's organs and tissues may be starved of oxygen because the blood is unable to flow through small blood vessels to get to them.

But the findings from the team indicate that eating more nitrate-rich vegetables could thin the blood by lowering the number of red blood cells produced, which could have important implications for health. Dr. Murray says:

"Here we show that nitrate from the diet can help regulate the delivery of oxygen to cells and tissues and its use, matching oxygen supply and demand. This ensures cells and tissues in the body have enough oxygen to function without needing to overproduce red blood cells, which can make the blood too thick and compromise health. Lowering the blood's thickness without compromising oxygen delivery may also help prevent blood clots, reducing the risk of a stroke or heart attack." In addition, the researchers note that their findings could lead to the discovery of better ways to deliver oxygen to cells, which may help the recovery of patients in intensive care units.

Dietary nitrate 'protects against heart, circulatory conditions'

Dr. Murray led the second study, which was recently published in *The Journal of Physiology*. In this research, the team exposed rats to high altitudes in order to trigger increased production of red blood cells.

They found that rats fed a diet with nitrate - the equivalent to humans adding slightly more green vegetables to their diets - were better protected against an array of heart and circulatory conditions than rats fed a nitrate-free diet.

This is because nitrate increases production of a compound that widens the blood vessels, according to the researchers, improving blood flow. What is more, the researchers found that nitrate protects proteins in heart cells that are crucial for heart health.

"Nitrate supplementation may thus be of benefit to individuals exposed to hypobaric hypoxia at altitude or in patients with diseases characterized by tissue hypoxia and energetic impairment, such as heart failure and chronic obstructive pulmonary disease, or in the critically ill," the team says.

Nitrate converts 'bad' fat cells into 'good' fat cells

In the third study - published in the journal *Diabetes* and led by Lee Roberts from the University of Cambridge - the team found that nitrate subjects "bad" white fat cells to a process called "browning," which converts them into beige cells.

The researchers explain that beige cells are similar to "good" brown fat cells, which burn fat in order to generate heat. Increased levels of brown fat have been associated with reduced risk of obesity and diabetes, therefore the team hypothesizes that incorporating nitrate into the diet could protect against these conditions.

Commenting on the findings of all three studies, Dr. Murray says: "There have been a great many findings demonstrating a role for nitrate in reducing blood pressure and regulating the body's metabolism. These studies represent three further ways in which simple changes in the diet can modify people's risk of type 2 diabetes and obesity as well as potentially alleviating symptoms of existing cardiovascular conditions to achieve an overall healthier life."

Medical News Today recently reported on a study suggesting the Mediterranean diet - rich in fruits, vegetables, nuts and olive oil - could slow the aging process.

❁❁❁

Study links Parkinson's disease to gut bacteria

12 December 2014 Medical News Today
A new study finds that compared to healthy controls, people with Parkinson's disease appear to have distinctly different gut bacteria. They have hardly any bacteria from one family and the amount present from another family seems to increase with disease severity.

The study, led by the University of Helsinki Institute of Biotechnology in Finland, is published in the journal *Movement Disorders*. It involved 72 patients with Parkinson's disease and an equal number of matched, healthy controls. More and more studies are discovering the huge influence that our gut bacteria - which vastly outnumber the cells of our body - have on our health: when they get sick, we get sick.

Parkinson's disease is a progressive motor disorder that develops when the brain loses cells that produce dopamine - a chemical that controls reward and pleasure and also regulates movement and emotional responses. Parkinson's symptoms include trembling, stiffness, slowness of movement and problems with balance and coordination. The disease rarely strikes before the age of 50 and gradually gets worse - to the point where everyday life and self-care becomes very difficult.

According to the National Parkinson's Foundation, up to 60,000 new cases of Parkinson's are diagnosed each year in the US, adding to the 1 million Americans who currently live with the condition. Some clues already

exist about the links between Parkinson's and gut problems. For example, as the study authors say in their paper, "gastrointestinal dysfunction, in particular constipation, is an important non-motor symptom" in Parkinson's disease, and "often precedes the onset of motor symptoms by years."

They also mention that recent research shows gut bacteria interact with parts of the nervous system via various pathways, including the enteric nervous system - the so-called "brain in the gut" - and the vagal nerve. Highlighting their findings, lead author of the new study, Dr. Filip Scheperjans, a neurologist in the Neurology Clinic of Helsinki University Hospital, says: "Our most important observation was that patients with Parkinson's have much less bacteria from the *Prevotellaceae* family; unlike the control group, practically no one in the patient group had a large quantity of bacteria from this family."

The team did not find out what an absence of *Prevotellaceae* might mean in Parkinson's disease. But they have many questions. For example, does this family of bacteria protect against the disease? Or does the disease wipe them out? "It's an interesting question which we are trying to answer," says Dr. Sheperjans.

Knowing about gut bacteria could help improve prognosis and treatment in Parkinson's

The team also found that levels of another family of bacteria called *Enterobacteriaceae* appear to be linked to severity of Parkinson's symptoms. They observed patients who had more difficulty with balance and walking tended to have higher levels of these bacteria. Dr. Sheperjans and his colleagues are already planning further research to explore the connection between Parkinson's disease and gut bacteria.

They have begun to re-examine the same group of patients to find out if the differences in gut bacteria are permanent or whether they change as the disease progresses. If they do change with disease progression, this could help doctors give more accurate prognoses.

"In addition," Dr. Sheperjans says, "we will have to see if these changes in the bacterial ecosystem are apparent before the onset of motor symptoms." And, he adds, they also want to discover the underlying biological mechanism between gut bacteria and Parkinson's disease.

They hope eventually that their findings will lead to new tests for Parkinson's and perhaps even new treatments to stop, slow or even prevent the disease by focusing on gut bacteria.

In November 2014, *Medical News Today* learned of a stem cell treatment breakthrough for Parkinson's disease. A study involving laboratory rats suggests it may be possible to replace dopamine cells lost to Parkinson's disease by making them from embryonic stem cells and then transplanting them into the brain.

❁❁❁

What are the health benefits of magnesium?

15 December 2014 Medical News Today

Magnesium is one of the seven essential macro minerals (requiring greater than or equal to 100mg/day). The human body contains approximately 20-28 milligrams of magnesium. Over 50% of that magnesium is stored in the skeletal system, and the rest is found in muscle, soft tissues and bodily fluids.

Magnesium plays an important role in over 300 enzymatic reactions within the body including the metabolism of food and synthesis of fatty acids and proteins. Magnesium is involved in neuromuscular transmission and activity and muscle relaxation. Magnesium deficiency, especially prevalent in older populations, is linked to insulin resistance, metabolic syndrome, coronary heart disease and osteoporosis.

This MNT Knowledge Center feature is part of a collection of articles on the health benefits of popular vitamins and minerals. It provides an in-depth look at recommended intake of magnesium, its possible health benefits, foods high in magnesium and any potential health risks of consuming magnesium.

Recommended intake

The Recommended Daily Allowance (RDA) for magnesium depends on age and gender. For children 1-8 years of age the RDA ranges from 80-130 milligrams. Children ages 9-13 are recommended to consume 240 milligrams of magnesium per day. After age 14, RDA recommendations are divided by gender, with men requiring more magnesium than women. After the age of 14, the RDA for men ranges from 400-420 milligrams. For women 14 years and older, the RDA ranges from 320-360 milligrams.

Magnesium has a medium level of bioavailability (the ability of a minerals absorption within the small intestine and retention of that mineral in the body for use). The efficiency of absorption depends on the amount of magnesium in the diet, overall magnesium status of the person and the diet as a whole. Unabsorbed magnesium is excreted in the feces.

Magnesium supplements are available, but it is best to obtain any vitamin or mineral through food. It is not the individual vitamin or mineral alone that make certain foods such an important part of our diet, but the synergy of all of that foods nutrients working together. It has been proven time and again that isolating certain nutrients in supplement form will not provide the same health benefits as consuming the nutrient from a whole food. First focus on obtaining your daily magnesium requirement from foods then use supplements as a backup.

Possible health benefits of consuming magnesium

Bone health

Magnesium is important for bone formation. High magnesium intakes are associated with a greater bone density and have shown to be effective for decreasing the risk of osteoporosis in postmenopausal women.

Diabetes

Several studies have confirmed the inverse relationship between magnesium intake and the risk of diabetes. For every 100mg/day increase in magnesium intake, the risk of developing type 2 diabetes decreases by approximately 15%. Most magnesium intake in these studies was from dietary sources, not supplements. Clinical studies have shown improvement in insulin sensitivity with magnesium intake between 300 and 365 mg/day.

Researchers were also able to show that low magnesium levels resulted in impaired insulin secretion and lower insulin sensitivity. Since magnesium plays an important role in carbohydrate and glucose metabolism, it is no wonder magnesium status has an effect on diabetes.

Heart health

Adequate magnesium intake has been associated with a lower risk of atherosclerosis and hypertension. Rapid post-heart attack administration of magnesium reduces the risk of mortality. Improvement in lipid profiles has been seen with an intake of 365 mg of magnesium per day.

Foods high in magnesium

The best sources of magnesium are nuts and seeds, dark green vegetables, whole grains and legumes. Magnesium is also added to some breakfast cereals and other fortified foods.

- Sunflower seeds, dry-roasted, ¼ cup: 128 milligrams
- Almonds, dry-roasted, ¼ cup: 105 milligrams
- Sesame seeds, roasted whole, 1 oz: 101 milligrams
- Spinach, boiled, 1 cup: 78 milligrams
- Cashews, dry-roasted, 1 oz: 74 milligrams
- Shredded wheat cereal, two large biscuits: 61 milligrams
- Soymilk, plain, 1 cup: 61 milligrams
- Black beans, cooked, ½ cup: 60 milligrams
- Oatmeal, cooked, 1 cup: 58 milligrams
- Broccoli, cooked, 1 cup: 51 milligrams
- Edamame, shelled, cooked, ½ cup: 50 milligrams
- Peanut butter, smooth, 2 tablespoons: 49 milligrams
- Shrimp, raw, 4 oz: 48 milligrams
- Black-eyed peas, cooked, ½ cup: 46 milligrams
- Brown rice, cooked, ½ cup: 42 milligrams
- Kidney beans, canned, ½ cup: 35 milligrams
- Milk, whole, 1 cup: 33 milligrams
- Banana, one medium: 33 milligrams
- Bread, whole-wheat, one slice: 23 milligrams.

Magnesium is lost during the refinement process of wheat, so look for cereals and bread products made with whole grains. Most common fruits, meat, and fish, are low in magnesium.

Potential health risks of consuming magnesium

Large doses of magnesium can cause a loss in central nervous system control and paralysis. Those with renal (kidney) insufficiency should not take magnesium supplements. It is very unlikely to reach magnesium toxicity with food intake and no cases have ever been reported.

It is the total diet or overall eating pattern that is most important in disease prevention and achieving good health. It is better to eat a diet with a variety than to concentrate on individual nutrients as the key to good health.

❁❁❁

Yoga comparable with walking, biking to improve cardiovascular risk

16 December 2014 Medical News Today

Promising new evidence published by the *European Journal of Preventative Cardiology* finds that yoga may provide the same benefits in risk factor reduction of cardiovascular disease as traditional physical activities.

Yoga has roots as an ancient mind-body practice that incorporates physical, mental and spiritual elements. Originating in India, yoga has been proven effective in numerous studies to improve cardiovascular risk factors, with a reduction in the risk of heart attacks and strokes.

Investigators from the US and Netherlands conducted a systematic review of 37 randomized controlled trials, which included 2,768 subjects. The aim of the analysis was to examine whether yoga is beneficial in managing and improving cardiovascular disease risk factors and whether it could be an effective therapy for cardiovascular health.

The researchers comment that the meta-analysis was performed to appraise the ongoing evidence and provide a realistic pooled estimate of yoga's effectiveness when measured against exercise and no exercise.

Results showed that risk factors for cardiovascular disease improved more in those practicing yoga than in those individuals not taking part in exercise. Yoga had an effect on risks factors comparable to exercise.

When compared with no exercise, yoga was associated with significant improvement in each of the primary outcome risk factors measured:

What is yoga?

> Yoga has become popular as a form of physical exercise based upon asanas (physical poses) to promote bodily or mental control and well-being.

Learn about the health benefits of yoga

- Body mass index (BMI) reduced by 0.77 kg/m^2 (measured as a "mean difference")
- Systolic blood pressure reduced by 5.21 mm Hg
- Low-density (bad) lipoprotein cholesterol reduced by 12.14 mg/dl
- High-density (good) lipoprotein cholesterol increased by 3.20 mg/dl.

Significant changes were also observed in secondary endpoints:

- Body weight decreased by 2.32 kg
- Diastolic blood pressure reduced by 4.9 mm Hg
- Total cholesterol reduced by 18.48 mg/dl
- Heart rate dropped by 5.27 beats/min.

No improvements were found in parameters of diabetes (fasting blood glucose and glycosylated hemoglobin).

Cardiovascular disease risk factor improvements in BMI, blood pressure and lipid levels were substantial when yoga was practiced in addition to medication. Meanwhile, in patients with existing coronary heart disease, yoga displayed a statistically significant benefit in lowering LDL cholesterol when added to statins and lipid-lowering drugs.

Individuals unable to perform aerobic exercise can still achieve cardiovascular benefits

Following the review of trials, researchers found that yoga may provide the same benefits in risk factor reduction as exercise such as brisk walking or biking.

"This finding is significant, as individuals who cannot or prefer not to perform traditional aerobic exercise might still achieve similar benefits in [cardiovascular] risk reduction," the authors say.

Evidence indicates yoga has comparable effects on risks factors as aerobic exercise. However, the researchers note that this could potentially be due to yoga's impact on stress reduction, "leading to positive impacts on neuroendocrine status, metabolic and cardio-vagal function."

"The similarity of yoga and exercise's effect on cardiovascular risk factors suggest that there could be comparable working mechanisms, with some possible physiological aerobic benefits occurring with yoga practice, and some stress-reducing relaxation effect occurring with aerobic exercise," say the investigators.

Senior author Prof. Myriam Hunink, from Erasmus University Medical Center in the Netherlands and Harvard School of Public Health in Boston, MA, says:

"Although the evidence of yoga's beneficial effect in cardiovascular health is growing, a physiological explanation for this effect remains unclear. Also unclear, are the dose-response relationship and the relative costs and benefits of yoga when compared to exercise or medication. However, these results indicate that yoga is potentially very useful and in my view worth pursuing as a risk improvement practice."

The authors of the research document that evidence supports yoga's acceptability to patients with pre-existing cardiac conditions, lower physical tolerance, the elderly or those with musculoskeletal or joint pain.

"Yoga has the potential to be a cost-effective treatment and prevention strategy given its low cost, lack of expensive equipment or technology, potential greater adherence and health-related quality of life improvements, and possible accessibility to larger segments of the population," the authors conclude.

Medical News Today recently reported on a study claiming that performing a single yoga pose for 90 seconds at least 3 days a week could reduce spine curvature in patients with scoliosis.

❁❁❁

What are the health benefits of potassium?

22 December 2014 Medical News Today

Potassium is one of the seven essential macro-minerals (requiring >100mg/day) along with calcium, magnesium, phosphorus, sodium, chloride and sulphur.

High potassium intakes are associated with a 20% decreased risk of dying from all causes, a reduced risk of stroke, lower blood pressure, protection against loss of muscle mass, preservation of bone mineral density and reduction in the formation of kidney stones.

Potassium's primary functions in the body include building muscle, synthesizing proteins, controlling the electrical activity of the heart and maintaining acid-base balance. Potassium is needed for maintenance of total body fluid volume, keeping electrolytes in balance and ensuring normal cell function.[1]

This MNT Knowledge Center feature is part of a collection of articles on the health benefits of popular vitamins and minerals. It provides an in-depth look at recommended intake of potassium, its possible health benefits, foods high in potassium and any potential health risks of consuming potassium.

Recommended intake

The Adequate Intake recommendation for potassium is 4,700 mg per day for adults. Most adults fall far short of this recommendation. According to the National Health and Nutrition Examination Survey (NHANES) report, the average potassium intake for Americans is 2,640 mg per day, a number that has remained unchanged since the 1990's.

NHANES also reported that fewer than 2% are meeting the daily 4,700mg potassium requirement. Females tend to take in less potassium than males.

The World Health Organization recommends an intake of 3,510 mg per day and agrees that most of the world's population is not meeting this recommendation.

Potassium supplements are available, but it is best to obtain any vitamin or mineral through food. It is not the individual vitamin or mineral alone that make certain foods an important part of our diet, but the synergy of the foods nutrients working together.

It has been proven that isolating certain nutrients in supplement form will not provide the same health benefits as consuming the nutrient from a whole food. First focus on obtaining your daily potassium requirement from foods then use supplements as a backup.

Possible health benefits of consuming potassium

Blood pressure and cardiovascular health

Low potassium intakes have been linked time and again with high blood pressure and cardiovascular disease.[1] Most people know that maintaining a low sodium intake is essential to lowering blood pressure, but did you know that increasing potassium intake may be just as important?

An increase in potassium intake along with a decrease in sodium is the most important dietary change a person can make to reduce their risk of cardiovascular disease, according to Dr. Mark Houston, a professor of medicine at Vanderbilt Medical School and director of the Hypertension Institute at St Thomas Hospital in Tennessee.

In one study, those who consumed 4,069 mg of potassium per day had a 49% lower risk of death from ischemic heart disease compared with those who consumed less potassium (about 1,000 mg per day).

Bone and muscle maintenance

Potassium-rich foods produce an alkaline environment in the body that battles the common acidosis caused by the typical Western diet. Metabolic acidosis is triggered by a diet full of high acid foods like meats and processed cereal grains, which can cause nitrogen excretion, loss in bone mineral density and muscle wasting. One study found that participants that took in 5,266 milligrams of potassium per day maintained an average of 3.6 more pounds of lean tissue mass than those with a potassium intake 50% lower. Some studies also show an increase in bone density with high potassium intake.[3]

Foods high in potassium

Potassium is found in many whole, unprocessed foods. Some of the best sources of potassium are leafy greens, avocados, tomatoes, potatoes, beans and bananas. Processing greatly reduces the amount of potassium in a food; therefore a diet high in processed foods is likely low in potassium. Many processed foods are also high in sodium and as sodium consumption rises, increased potassium is needed to negate sodium's effect on blood pressure.[1] A good rule of thumb is to have a high potassium fruit or vegetable with each meal.

Avocados are a great source of potassium, with half of one providing 602 mg.

- Potato, large, baked, with skin: 845 milligrams
- Sweet potato, baked (146 grams): 694 milligrams
- Avocado, ½ medium: 602 milligrams
- Cantaloupe, raw, 1 cup: 417 milligrams
- Mushrooms, 10 small: 415 milligrams
- Beet greens, cooked, ½ cup: 650 milligrams
- White beans, canned, ½ cup: 595 milligrams
- Tomatoes, 1 cup: 528 milligrams
- Soybeans, green, cooked ½ cup: 485 milligrams
- Lima beans, cooked, ½ cup: 484 milligrams
- Winter squash, cooked, ½ cup: 448 milligrams
- Banana, 1 medium: 422 milligrams
- Spinach, cooked, ½ cup: 419 milligrams
- Yogurt, low fat, plain: 398 milligrams
- Pear, 1 medium: 333 milligrams
- Mango, 1 medium: 323 milligrams
- Orange, 1 medium: 300 milligrams
- Pistachios, dried, 1 oz: 310 milligrams
- Raisins, ¼ cup: 271 milligrams.

Potential health risks of consuming potassium

In individuals with healthy kidneys, excess amounts of potassium are efficiently excreted in urine with no adverse side effects. There have been a small number of reports of potassium toxicity associated with an extremely high intake of potassium supplements. No potassium toxicity has ever been reported related to food consumption.

Consuming too much potassium can be harmful to those whose kidneys are not fully functional. If your kidneys are unable to remove excess potassium from the blood, it could be fatal.

It is the total diet or overall eating pattern that is most important in disease prevention and achieving good health. It is better to eat a diet with a variety than to concentrate on individual nutrients as the key to good health.

❁❁❁

Red wine compound activates stress response to promote health benefits

23 December 2014 Medical News Today
By now, most of us have heard of resveratrol - a compound found in red wine and grapes that has been linked to an array of health benefits, such as reduced risk of age-related diseases. Researchers have long investigated how resveratrol promotes such benefits. Now, scientists from The Scripps Research Institute in La Jolla, CA, offer a new suggestion; the compound stimulates a stress response gene, which activates a number of genes that protect the body.

The research team, led by Mathew Sajish of the Skaggs Institute for Chemical Biology at The Scripps Research Institute (TSRI), publish their findings in the journal *Nature*. Past research has associated resveratrol with longevity and reduced risk of cardiovascular disease (CVD). Last year, *Medical News Today* reported on a study claiming the compound could help treat several cancers by sensitizing diseased cells to treatment, while another study claimed resveratrol can protect against hearing loss and cognitive decline.

More recently, however, some studies have blasted the health benefits of resveratrol. In May, researchers from Johns Hopkins University School of Medicine in Baltimore, MD, claimed people who consume a diet rich in resveratrol are at no lower risk of CVD or cancer than those who consume small amounts of the compound.

Sajish and senior investigator Paul Schimmel - also of the Skaggs Institute for Chemical Biology at TSRI - note that some researchers have questioned the health benefits of resveratrol because many studies have used "unrealistically high doses" of the compound.

In this latest study, the researchers set out to determine if resveratrol really is beneficial for health and if so, how the compound promotes such benefits.

Resveratrol binds to TyrRS enzyme to activate protective genes

Sajish and Schimmel investigated resveratrol's association with tRNAsynthetases - enzymes that aid translation of genetic material during protein synthesis.

In particular, the researchers focused on a specific tRNAsynthetase called TyrRS - an enzyme that binds with an amino acid called tyrosine before linking up with encoding genetic material - after a former investigator at TSRI found that it can relocate to the cell nucleus under stressful conditions, effectively adopting a protective role.

Since resveratrol has been shown to have similar properties to tyrosine and has been associated with a comparable stress response, Sajish says he wanted to see whether TyrRS is a target for the compound.

Using X-ray crystallography and other tests to compare resveratrol with TyrRS, the researchers found that resveratrol mimics tyrosine, so much so that TyrRS was able to bind with resveratrol. The team explains that this attachment led TyrRS away from its protein translation activity and pushed it toward the cell nucleus.

Once in the nucleus, the researchers found that the TyrRS-resveratrol combination switched on a gene called PARP-1 - known to play a role in stress response and DNA repair and to have a major influence on aging. What is more, activating PARP-1 also switched on a number of other protective genes, including FOXO3A and SIRT6 - associated with longevity - and the tumor-suppressor gene p53.

The team notes that their findings were confirmed when they injected mice with resveratrol.

'A couple of glasses of red wine' could evoke protective effect of resveratrol

Interestingly, Sajish and Schimmel found that the TyrRS-PARP1 pathway can be activated with doses of resveratrol up to 1,000 times lower than doses that have been used in past studies investigating the compound's health benefits.

"Based on these results, it is conceivable that moderate consumption of a couple glasses of red wine would give a person enough resveratrol to evoke a protective effect via this pathway," says Sajish, adding:

"This stress response represents a layer of biology that has been largely overlooked, and resveratrol turns out to activate it at much lower concentrations than those used in prior studies.

With these findings we have a new, fundamental mechanism for the known beneficial effects of resveratrol."

He adds that because previous research has used such high doses of resveratrol, this may have confounded some results.

Resveratrol triggers a similar stress-response pathway in plant cells, according to the researchers, and they believe the compound has grown to produce a similar effect in human cells. "We believe that TyrRS has evolved to act as a top-level switch or activator of a fundamental cell-protecting mechanism that works in virtually all forms of life," says Sajish.

Earlier this month, *MNT* reported on a study by researchers from the University of Colorado Cancer Center claiming resveratrol has both cancerous and anti-cancerous properties.

❁❁❁

What are the health benefits of iron?

Medical News Today 24 December 2014

Iron deficiency anemia is the world's most common nutritional deficiency disease and is most prevalent among children and women of childbearing age. Anemia develops due to an inadequate amount of iron in the diet or poor iron absorption.

Iron deficiencies can be caused or exacerbated by injury, blood loss, hemorrhage or gastrointestinal diseases that impair iron absorption. Inadequate intake of folate, protein and vitamin C can also contribute to iron deficiency.

MNT Knowledge Center feature is part of a collection of articles on the health benefits of popular vitamins and minerals. It provides an in-depth look at recommended intake of iron, its possible health benefits, foods high in iron and any potential health risks of consuming iron.

Recommended intake

The Recommended Daily Allowance (RDA) for iron depends on age and gender.

Children:

- 1-3 years - 7 milligrams
- 4-8 years - 10 milligrams.

Males:

- 9-13 years - 8 milligrams
- 14-18 years - 11 milligrams
- 19 years and older - 8 milligrams.

Females:

- 9-13 years - 8 milligrams
- 14-18 years - 15 milligrams
- 19-50 years - 18 milligrams
- 51 years and older - 8 milligrams.

Pregnancy:

- 27 milligrams.

An estimated 8 million women of childbearing age in the US suffer from iron deficiency severe enough to cause anemia. Iron deficiency during pregnancy may raise the risk for preterm delivery.

Iron supplements are available, but it is best to obtain any vitamin or mineral through food first. It is not the individual vitamin or mineral alone that make certain foods an important part of our diet, but the synergy of the foods nutrients working together. It has been proven time and again that isolating certain nutrients in supplement form will not provide the same health benefits as consuming the nutrient from a whole food. First focus on obtaining your daily iron requirement from foods then use supplements as a backup.

Possible health benefits of consuming iron

Iron deficiency can cause many health problems. Common difficulties associated include delayed cognitive function, poor exercise performance and lowered immune function. In children, iron deficiency anemia can cause psychomotor and cognitive abnormalities resulting in future learning difficulties.

Healthy pregnancy

Low iron intakes increase a woman's risk of premature birth and the risk of her infant having low birth weight, low iron stores and impaired cognitive or behavioural development.

More energy

Not getting enough iron in your diet can affect how efficiently your body uses energy. Iron carries oxygen to the muscles and brain and is crucial for both mental and physical performance. Low iron levels may result in a lack of focus, and an increase in irritability.

Better athletic performance

Iron deficiency is more common among athletes, especially young female athletes, than sedentary individuals. Iron deficiency in athletes decreases athletic performance and weakens immune systems. A lack in hemoglobin iron can greatly reduce physical work performance via a decrease in oxygen transport to exercising muscle.

Foods high in iron

Iron has a low bioavailability, meaning that it has poor absorption within the small intestine and low retention in the body, decreasing its availability for use. The efficiency of absorption depends on the source of iron, foods consumed with the iron, and overall iron status of the person. In many countries, wheat products and infant formulas are fortified with iron.

There are two types of dietary iron - heme and non-heme. Most animal products and seafood contain heme iron, which is easier to absorb than non-heme. Non-heme iron sources include beans, nuts, vegetables and fortified grains. The recommended iron intake for vegetarians is 1.8 times higher than for those who eat meat in order to make up for the lower absorption level from plant-based foods.

Proton pump inhibitors (lansoprazole [Prevacid®] and omeprazole [Prilosec®]) used to reduce the acidity of stomach contents can inhibit the absorption of iron. The polyphenols and tannins in coffee and tea also decrease non-heme iron absorption. Eating foods that are high in vitamin C, on the other hand, help to increase iron absorption.

- Clams, canned, 3 oz: 24 milligrams
- Cereal, fortified, one serving: 1-22 milligrams
- White beans, canned, 1 cup: 8 milligrams
- Chocolate, dark, 45-69% cacao, 3 oz: 7 milligrams
- Oysters, cooked, 3 oz: 6 milligrams
- Spinach, cooked, 1 cup: 6 milligrams
- Beef liver, 3 oz: 5 milligrams
- Blueberries, frozen, ½ cup: 5 milligrams
- Lentils, boiled and drained, ½ cup: 3 milligrams
- Tofu, firm, ½ cup: 3 milligrams
- Chickpeas, boiled and drained, ½ cup: 2 milligrams
- Tomatoes, canned, stewed, ½ cup: 2 milligrams
- Ground beef, lean, 3 oz: 2 milligrams

- Potato, baked, medium: 2 milligrams
- Cashew nuts, roasted, 1 oz: 2 milligrams
- Egg, 1 large: 1 milligram.[1,2]

Potential health risks of consuming iron

The tolerable upper intake level for iron is between 40-45 milligrams. Adults with healthy functioning gastrointestinal systems have a very low risk of iron overload from dietary sources.

Taking iron supplements of 20 milligrams or more on a frequent basis can cause nausea, vomiting and stomach pain, especially if the supplement is not taken with food. In severe cases, iron overdoses can lead to organ failure, coma, seizure, and even death.

Some studies have suggested that excessive iron intake can increase the risk of coronary heart disease and cancer.

Iron supplements can interact with several medications, including levodopa (used to treat restless leg syndrome and Parkinson's) and levothyroxine (used to treat hypothyroidism, goiter, and thyroid cancer).

It is the total diet or overall eating pattern that is most important in disease prevention and achieving good health. It is better to eat a diet with a variety than to concentrate on individual nutrients as the key to good health.

❁❁❁

Diabetes at Midlife Linked to Cognitive Decline with Age

Nutraceuticals World December 4, 2014
Middle-aged diabetics have a greater chance of developing memory and cognitive problems during the preceding 20 years than their counterparts with healthy blood sugar levels.
This is according to Johns Hopkins Bloomberg School of Public Health researchers, who found that diabetes appears to age the mind roughly five years faster beyond the normal effects of aging. For example, on average, a 60-year-old with diabetes experiences cognitive decline on par with a healthy 65-year-old aging normally. Decline in memory, word recall and executive function is strongly associated with progression to dementia, a loss of mental capacity severe enough to interfere with a person's daily functioning.

A report on the research was published in the Dec. 2 issue of the journal *Annals of Internal Medicine*. The study is believed to be the longest of its kind following a cross-section of adults as they age.

“The lesson is that to have a healthy brain when you’re 70, you need to eat right and exercise when you’re 50,” explained study leader Elizabeth Selvin, PhD, MPH, an associate professor of epidemiology at the Johns Hopkins Bloomberg School of Public Health. “There is a substantial cognitive decline associated with diabetes, pre-diabetes and poor glucose control in people with diabetes. And we know how to prevent or delay the diabetes associated with this decline.”

For the study, Selvin and the team used data from the Atherosclerosis Risk in Communities Study (ARIC), which in 1987 began following a group of 15,792 middle-aged adults in communities in Maryland, North Carolina, Minnesota and Mississippi. Participants were seen at four visits approximately three years apart beginning between 1987 and 1989, and were seen a fifth time between 2011 and 2013. Cognitive function was evaluated at visits two (1990-1992), four (1996-1998) and at visit five.

The researchers compared the amount of cognitive decline associated with aging with the amount of decline found in the ARIC participants. They determined that there was 19 percent more decline than expected in

those participants with poorly controlled diabetes, as well as smaller declines for those with controlled diabetes and pre-diabetes. The outcomes were the same whether the participants were white or black.

Selvin says the results underscore the importance of using a combination of weight control, exercise and a healthy diet to prevent diabetes. Even losing just five to 10 percent of body weight, she says, can keep someone from developing diabetes. Diabetes is a function of elevated sugar (glucose) levels in the blood. This excess glucose can damage tissues and the vascular system throughout the body and diabetes is associated with blindness, nerve damage in the extremities and kidney disease. While diabetes can often be controlled through medication, exercise and changes to diet, disease prevention is the preferred goal.

"If we can do a better job at preventing diabetes and controlling diabetes, we can prevent the progression to dementia for many people," Selvin said. "Even delaying dementia by a few years could have a huge impact on the population, from quality of life to health care costs."

Nationwide, dementia costs in 2010 were estimated to be upwards of $159 billion a year and, with the aging of the population, are expected to increase by nearly 80% by 2040.

Researchers are increasingly aware of the importance of many other causes of dementia besides Alzheimer's disease, particularly cognitive impairment linked to abnormalities in blood vessels in the brain.

"There are many ways we can reduce the impact of cerebral blood vessel disease— by prevention or control of diabetes and hypertension, reduction in smoking, increase in exercise and improvements in diet," said co-author A. Richey Sharrett, MD, DrPH, an adjunct professor at the Johns Hopkins Bloomberg School of Public Health. "Knowing that the risk for cognitive impairments begins with diabetes and other risk factors in mid-life can be a strong motivator for patients and their doctors to adopt and maintain long-term healthy practices."

Research has shown that the single best predictor of type 2 diabetes is being obese or overweight and, in the U.S. alone, more than one-third of adults (more than 72 million people) are obese, defined as having a Body Mass Index of 30 or more about 30 pounds overweight. Meanwhile, the diabetes epidemic has grown rapidly over the past several decades, affecting approximately 10 percent of American adults (21 million people).
❁❁❁

Meta-Analysis Quantifies Effect of Oat Beta-Glucans on Cholesterol

Nutraceuticals World January 5, 2015

Health claims regarding the cholesterol-lowering effect of soluble fiber from oat products, approved by food standards agencies worldwide, are based on a diet containing ≥3 g/d of oat beta-glucan (OBG). Given the number of recently published randomized controlled trials (RCTs), researchers sought to update the findings of previous meta-analyses.

The objective was to quantify the effect of ≥3 g OBG/d on serum cholesterol concentrations in humans and investigate potential effect modifiers. A meta-analysis was performed on 28 RCTs comparing ≥3 g OBG/d with an appropriate control. Systematic searches were undertaken in PubMed, AGRICOLA and Scopus between January 1, 1966 and June 6, 2013, plus in-house study reports at CreaNutrition AG. Estimates of the mean reduction in serum cholesterol from baseline between the OBG and control diets were analyzed by using random-effects meta-analysis models and meta-regression.

OBG in doses of ≥3 g/d reduced low-density lipoprotein (LDL) and total cholesterol relative to control by 0.25 mmol/L (95% CI: 0.20, 0.30; $P < 0.0001$) and 0.30 mmol/L (95% CI: 0.24, 0.35; $P < 0.0001$), respectively, with some indication of heterogeneity ($P = 0.13$ and $P = 0.067$). There was no significant effect of OBG on high-density lipoprotein (HDL) cholesterol or triglycerides and no evidence that dose (range across trials: 3.0–12.4 g/d) or duration of treatment (range: 2–12 wk) influenced the results. LDL cholesterol lowering was

significantly greater with higher baseline LDL cholesterol. There was a significantly greater effect for both LDL and total cholesterol in subjects with diabetes compared with those without (although based on few studies).

Researchers concluded that adding ≥3 g OBG/d to the diet reduces LDL and total cholesterol by 0.25 mmol/L and 0.30 mmol/L, respectively, without changing HDL cholesterol or triglycerides.
❁❁❁

Omega-3 DHA: Stress During Pregnancy

Nutraceuticals World December 1, 2014

This study was designed to test the association between docosahexaenoic acid (DHA) supplementation and perceived stress and cortisol response to a stressor during pregnancy in a sample of African American women living in low-income environments.

Sixty-four African American women were enrolled at 16-21 weeks of gestation. Power calculations were computed using published standard deviations for the Perceived Stress Scale and the Trier Social Stress Test. Participants were randomized to either 450 mg per day of DHA (n=43) or placebo (n=21). At baseline and at 24 and 30 weeks of gestation, perceived stress was assessed by self-report. Cortisol response to a controlled stressor, the Trier Social Stress Test was measured from saliva samples collected upon arrival to the laboratory and after the completion of the Trier Social Stress Test.

Women in the DHA supplementation group reported lower levels of perceived stress at 30 weeks of gestation, controlling for depression and negative life events (mean 27.4 compared with 29.5, F [3, 47] 5.06, P=.029, Cohen's d=0.65). Women in the DHA supplementation had lower cortisol output in response to arriving to the laboratory and a more modulated response to the stressor (F [1.78, 83.85] 6.24, P=.004, Cohen's d=0.76).

Pregnant women living in urban low-income environments who received DHA reported reduced perceived stress and lower levels of stress hormones in the third trimester. DHA supplementation may be a method for attenuating the effects of maternal stress during late pregnancy and improving the uterine environment with regard to fetal exposure to glucocorticoids, researchers concluded.
❁❁❁

Saturated fat: Should dietary advice change?
28-Nov-2014 Food Navigator

Is saturated fat less 'bad' than previously thought? In this guest feature, nutrition writer Ursula Arens examines the evidence.
This year, the gloves have come off in the arena of disputes within lipid metabolism. No longer just slight hints of disdain and micro-correction among genteel academics at learned conferences, the battles now rage in shouty blogs, press headlines and anecdote-filled books.

The new message, the one that is very much counter to current nutrition policy and firm dietetic advice and now cast-in-concrete food labelling laws, is that saturated fat is not bad at all; cream is not 'naughty but nice' - it is just nice. Should dieticians shift the long-steady rudder of dietary advice on saturates in relation to blood cholesterol levels and heart disease risk?

A year ago (October 2013), an opinion piece written by cardiologist Dr Aseem Malhotra, was published in the *British Medical Journal*. The article: 'From the Heart: saturated fat is not the major issue - let's bust the myth of its role in heart disease', was very widely discussed in media. Then, in March 2014, a bombshell paper was published in the *Annals of Internal Medicine*. Lead author Rajiv Chowdhury is a cardiovascular epidemiologist at the University of Cambridge, and major funding for the study came from the British Heart Foundation and the Medical Research Council. Impeccable expertise went into the study; explosive results came out.

Chowdhury and colleagues did a systematic review and meta-analysis of published studies reporting dietary, circulating or supplement-source fatty acids and the risk of coronary disease. There were 32 studies with data on fatty acids from dietary intakes (from more than 510,000 participants), 17 studies with data of fatty acid biomarkers (from more than 25,000 participants) and 27 randomised controlled trials with data on fatty acid supplementation (from more than 105,000 participants).

Clarity on trans fats

Coronary outcomes in prospective cohort studies of dietary intakes showed a significant 16 percent increase in risk in people who consumed the top third of intakes of trans fatty acids compared to those with the bottom third of intakes. So there is clarity: higher intakes of dietary source trans fats increase the risk of coronary outcomes. However, the other observations were less consistent with expectations. The top versus bottom tertiles of saturated fatty acid intakes showed a small three percent increase in risk, and only very small reductions in risk of one percent and two percent could be observed for intakes of alpha linolenic and total n-6 fatty acids.

Long chain n-3 fatty acids were protective (a 13 percent risk reduction in top tertile intakes), so fish eating remains a good idea. In contrast, variations in intakes of monounsaturated fatty acids showed zero effects on coronary events, so should olive oil messaging be muted?

Looking at perhaps more accurate data from circulating fatty acids (in contrast to perhaps fuzzy food diary descriptions), another picture emerged. While total saturated fatty acids increased the risk of coronary outcomes by six percent, further breakdown by individual fatty acids showed the extremes of a 23 percent increase with stearic fatty acid (18:0), in contrast to a 33 percent reduction with margaric fatty acid (17:0).

Trans fats appear minimally bad (five percent increase), total monounsaturated fatty acids appear even worse (six percent increase), while total n-3 and n-6 appear mildly protective, with reductions of seven percent and six percent in the risk of a coronary outcome.

What about fatty acid supplements in relation to the risk of a coronary event? Perhaps obviously, there are no studies where participants are asked to take supplements with saturated fatty acids. Studies of alpha-linolenic acid supplements (n-3) show risk reductions of three percent long-chain n-3 supplements protect by six percent, and the surprise of more potent effects was that supplementary intakes with n-6 fatty acids protect by 14 percent.

In relation to diet and prospective risks of coronary disease, Chowdhury and colleagues conclude essentially 'no effects' with saturates or with n-6 polyunsaturates, or with monounsaturates, but some lower risk with dietary n-3 polyunsaturates.

Their final statement is, 'current evidence does not clearly support cardiovascular guidelines that encourage high consumption of polyunsaturated fatty acids and low consumption of total saturated fats.'

Challenges and critiques

There were some academic responses to the Chowdhury review and some corrections were made post publication. The most immediate critique came the epidemiologists at the Harvard School of Public Health (although one of the HSPH staff, Dariush Mozaffarian, was in fact also a co-author of the Chowdhury review).

Professor Walter Willett and colleagues challenged the lack of effect described for n-6 fatty acids, and specifically corrected some of the data used in the review. Major studies that did show significant inverse associations between intakes of polyunsaturated fat intake (mainly as n-6) and the risk of coronary disease had not been included by

Chowdhury. Further, Willett and colleagues also stated that most of the monounsaturated fat consumed in the studies were from red meat and dairy sources, and that the findings might not apply for analysis of plant source monounsaturates. The Harvard experts state, "the conclusions…regarding the type of fat being unimportant are seriously misleading and should be disregarded." It is striking, however, that Willett and colleagues make no comment on the observations by Chowdhury of 'no effect' for intakes of saturates.

Other critiques, reported in Science magazine by K Kupferschmidt, are that diets replacing saturated fats with carbohydrates, and more dramatically diets with lower intakes of monounsaturates and polyunsaturates with higher energy intakes from carbohydrates, have been shown to increase the risk of coronary disease.

Professor Mozaffarian, the man in the uncomfortable position of straddling two stools, as both author and critic of his own paper, stated that he was not happy with the conclusions of the paper about polyunsaturated fats (but he supported the no effects for mono and saturated fats). Less impressive responses by the University of Cambridge researchers to the general excitement about the paper, was that the main problem had been that the paper had been, "wrongly interpreted by the media" (?), and that "more good trials were needed".

Call for better nutritional studies
In fact, the paper is perhaps a general call to consider the limits of meta-analysis in relation to the population assessment of dietary data. Walter Willett was concerned that while drug trials are often a similar design, so it is possible to combine results, this was not true for nutritional studies, which vary widely in how they are set up. "Often strengths and weaknesses of individual studies get lost."

A similar concern was expressed by Professor Bruce Griffin of the University of Surrey, to a London meeting of the Guild of Health Writers in September 2014. Many of the individual studies included in the review by Chowdhury and colleagues showed clear effects of fatty acids on coronary risk, but these were lost when data were merged. He illustrated the concept with the discrete traits of items within a fruit bowl, which become less distinct and identifiable when the same items are mashed into a blended salad or smoothie.

Fats, not carbs
About half of adults in the UK have elevated blood cholesterol levels, above 5.2 mmol/L. Current dietary intakes of saturated fats in the UK diet (as reported in the four year rolling programme of the National Diet and Nutrition Survey) are about 12.0-13.3% of energy, which is higher than the recommended amounts of no more than 10 percent of energy.

Dietary fat modification appears to result in more successful outcomes in preventing cardiovascular disease than fat reductions (Hooper, 2011) and, while saturates may be less 'bad' than current dietary guidelines suggest, data supports the inclusion of monounsaturates and polyunsaturates in the diet (rather than some replacement of fats with carbohydrates).

Possible future reviews of dietary public health recommendations on saturated fats will certainly consider current evidence, and dieticians will be the authoritative channels to communicate the up-to-date guidance, whether constant or changed. However, a problem of today for all health professionals, is the occasional clash between the near-daily outcomes of latest published evidence and the long-developed guidelines and policies that guide medical advice.
❁❁❁
Scientists shine light on 'aerated' dairy drink with satiety potential
10-Dec-2014 Food Navigator USA

Nottingham University scientists claim to have shone new light on the intra-gastric behaviour of 'aerated' drinks with enhanced satiating properties that they say could be used to fight obesity.

Setting their study (free to access via the link below) within the context of a global obesity epidemic, Murray et al. Suggest that overeating pleasurable, energy dense foods and beverages with a low appetite value could be a major contributor, and that cutting consumption of these products could help.

Compliance with weight management programs relies on judging the appetite value of food, they write – determined by its volume, whether it is liquid or solid and its energy density and palatability. Consequently, the team say that entrapping large volumes of water or air into food could be an alternative approach to designing foods and beverages with an increased ability to satiate but with reduced caloric density.

The scientists cite two other recent studies – Melnikov et al. 2014 and Peters et al. 2014 – showing that aerated drinks significantly reduce hunger and increase satiety more than non-aerated foods.

Sweetened, dairy-based drink used in trial
In this study, Murray et al. report on a randomized crossover trial involving 18 healthy male volunteers consuming three different skimmed milk-based test products of 110kcal each. Two drinks containing skimmed milk powder, water, xanthan gum and lemon syrup were aerated to foams by whipping to 490ml: one of which was designed to be more stable in the stomach than the other. A third non-aerated drink with the same ingredients was used as a control.

The subjects, who fasted beforehand and were told not to drink alcohol or exercise, were told to drink 150g of one of the three drinks (selected on a random basis on each test day) within 10 minutes; MRI measurements and appetite assessments were carried out for the next four hours. During this time, stomach contents (intra-gastric foam, air and liquid) were imaged using magnetic resonance imaging (MRI) – foam was visualized for the first time using this technology, the authors believe – while self-reported appetite ratings were collected and quantified.

Foam stability enhances 'hunger suppression' effect?
Compared with the control, both foams caused significant increased gastric volumes and reduced hunger, with the more stomach-stable foam also showing a significantly slower decrease in total gastric content and foam volume. Both foams returned similar 'reported hunger' scores.

"In conclusion, this trial provides novel insights, to our knowledge, of the intra-gastric behaviour of aerated drinks,"
Murray et al. write, noting their ability to measure separate volumes of foam liquid and air in the stomach. *"The data suggest that the hunger suppression induced by aerated drinks could largely be explained by effects on gastric volumes and emptying, which may be further enhanced by foam stability*.

"Such knowledge and methods could be useful to aid the manufacture of aerated products by providing an objective assessment of in vivo performance and improved understanding of mechanisms affecting gastrointestinal physiology and appetite," they add.
❁❁❁
What drives unhealthy snacking?
02-Dec-2014 Food Navigator

Enjoying a special occasion, opportunistic eating and social pressures are just some of the drivers behind unhealthy snacking – factors that could be used to drive change, researchers claim.

Published in *Appetite*, researchers from the Netherlands investigated the social drivers behind unhealthy snacking – an area they said had been given little attention in the past. An 'unhealthy snack' was defined as all foods consumed between the three main meals (breakfast, lunch, dinner) containing high amounts of ingredients like fat and sugar. Products including crisps, salted nuts, popcorn, cookies, pies, candy bars, chocolate, toast, cheese and ice cream were among those considered as an 'unhealthy snack'.

Findings indicated six categories behind unhealthy snacking: opportunity induced eating, coping with negative emotions, enjoying a special occasion, rewarding oneself, social pressure, and gaining energy. *"The reasons identified in the present study demonstrate a remarkable large diversity, showing that a broad range of situations is mentioned as a reason to consume unhealthy snacks. These include opposite factors like experiencing positive affect and sadness, or having worked hard as well as having a day off,"* the researchers wrote. While they said the six categories were not an exhaustive list of reasons, they covered the dominant drivers.

Who, why and when?
Participants were asked to fill out a 'Reasons to Snack' questionnaire based on 35 items, including open ended questions. From the survey of 1,544 participants (conducted twice with a one-month interval), findings

showed ‘enjoying a special occasion’ to be the biggest driver behind unhealthy snacking, closely followed by ‘opportunity induced eating’.

Unhealthy snacking to enjoy a special occasion was an area the researchers said had received little attention in previous research and was a *“novel category”. “Unhealthy snack consumption, rather than eating behavior in general, is likely particularly associated with enjoying a special occasion, such as being at a party,”* they wrote.

Very close behind ‘opportunity induced eating’ came a desire ‘to gain energy’. The study found that differences in reasons for unhealthy snacking were most profound for age. *“Except for enjoying a special occasion, younger people indicated a higher score for each category,”* the researchers said. In addition, women had higher scores compared to men for half the reasons, they said, including coping with negative emotions, enjoying a special occasion and gaining energy.

Prevention and healthy strategies

These findings, the researchers said, could be used to construct health interventions or drive forward healthy snacking alternatives. *“A stronger focus on enjoying a special occasion and on opportunity induced eating may be adopted as participants indicated these categories as relatively most important for unhealthy snacking. This could for instance be done by promoting the availability of healthy alternatives when celebrating an event, and on impulse control to combat opportunity induced eating,”* they said.

❁❁❁

Food Science & Industry News

Peeling tomatoes prior to juicing may enhance liking
A study published in the *Journal of Food Science* shows that peeling tomatoes before they are juiced when using a cold break process may enhance the viscosity and preference for tomato juice. Tomatoes are typically not peeled before being made into juice but the peels contain enzymes that affect the odour, flavour, and viscosity of the juice. The peels are removed in the finisher, but their presence during the break process may affect quality.

The researchers processed juice from peeled and unpeeled tomatoes using hot or cold break. The juices were pasteurized by high temperature short time (HTST), low temperature long time (LTLT), or with a retort. In addition, the control samples were treated with 10% calcium chloride to stop enzymatic activity in the juice. They made sauce from juice and the tomato products were analyzed for volatiles, colour, viscosity, and by sensory.

Cold break juice made with peel contained higher levels of some lipoxygenase-, carotenoid-, and amino acid–derived volatiles, than the juice made without peel. Because of the lack of enzyme activity, hot break juices had lower levels of these volatiles and there was no significant difference between hot break juices made with and without peel. Calcium chloride-treated and HTST juice had higher levels of most of the volatiles than LTLT, including the lipoxygenase-derived volatiles.

The researchers found that the presence of peel produced a significant decrease in the viscosity of the cold break juice and sauce. There was no significant difference in the hue angle, total soluble solids, pH, titratable acidity, and vitamin C for most of the treatments. The texture, flavour, and overall liking of cold break juice made without peel were preferred over cold break juice made with peel, whereas the colour was less preferred. Between the sauces no significant differences in preference were obtained.

IFT Weekly December 10, 2014
❁❁❁
Advances in nanotechnology can improve food safety and prep
10-Dec-2014, Food Navigator USA

A consumer backlash based on the fear of the unknown may have temporarily blocked marketing of nanotechnology in foods, but the ability to manipulate particles 100,000 times smaller than a strand of hair could improve food safety and prep, according to a Cornell University associate professor.

The small size of nanomaterials offers significant opportunities for developing pathogen-resistant surfaces that could be used to reduce the risk of cross-contamination of bacteria in food processing plants and the transmission of food borne illness via packaging, said Carmen Moraru, an associate professor in the Department of Food Science at Cornell University.

She explained at the Cornell Food Systems Global Summit Dec. 8 at Cornell University that nanomaterials are unique in that they have different physical and chemical properties than their scaled-up versions and are governed by quantum mechanics, which allows them to function in ways their larger counterparts cannot. For example, through nanofabrication anodization smooth metal surfaces, which are popular gathering grounds for pathogens, convert to a durable, corrosion-resistant, anodic surfaces covered with interlocking honeycomb shaped pores to which it is difficult for bacteria to stick, Moraru said.

While it is possible to control the size of the pores, research shows the most effective size pores for repelling bacteria is 15-25 nanometers, Moraru said, adding, any larger and the pores will trap bacteria. Nanofabrication also, *"in food processing plants, could reduce energy, cleaning costs and waste water streams,"* Moraru said.

Nanotechnology also can ease cooking preparation by helping food not stick to pans and utensils, she noted. At least 15 cooking products available in the U.S. already use this technology, according to an inventory of consumer products made with nanotechnology compiled by the Project on Emerging Nanotechnologies (PEN).

PEN is an organization *"dedicated to helping ensure that as nanotechnologies advance, possible risks are minimized, public and consumer engagement remains strong and potential new benefits realized,"* according to it is website.
The potential applications of nanofabrication also extend to bio medical equipment and water processing applications, said Moraru, who added current *"research is very active in nano delivery systems."*

Pause for concern
Moraru noted the benefits of nanotechnology are no longer marketed on most consumer products, including foods, made with the technology because consumer uncertainty about its safety led to a backlash against the technology when it was first emerging commercially.

"Consumers get really concerned when there are things they can't understand well," Moraru said. She explained that when nanotechnology first became a financially viable option for new product development manufacturers *"though it was neat"* and used it as a *"buzz word*," but *"the public was taken aback"* and rejected the technology. Now marketers are much more careful and do not use the term much.

The public's response to nanotechnology is not unwarranted, Moraru acknowledged. *"We really don't understand fully how the integration of nanoscale matter interacts with the human body,"* and whether it can penetrate the skin or cross the blood-brain barrier. *"That is where a lot of work needs to be done,"* she noted.

Still, she told attendees, nanoscale matter already is in the food supply both naturally – such as nanosized proteins – and as intentionally manipulated molecules. She added most manipulated nanomolecules are in supplements and very few are in foods.

FDA chimed in on the debate about nanotechnology in food and drug products with draft guidance issued in May 2012. The guidance discussed whether changes in manufacturing processes can affect the safety of food. However, critics say the voluntary guidance is insufficient.

❁❁❁
Can seaweed become the ultimate salt replacer – and why hasn't it yet?
21-Nov-2014 Food Navigator

Seaweed is well-researched, sustainable and effective, according to an expert. So what is stopping it from really taking off as a salt replacer?

Taking to Food Navigator at Food Matters Live 2014 in London, Dr Craig Rose from Seaweed Health Foundation, said: *"There has been a lot of interesting discussion on this. Seaweed ticks so many boxes the market is crying out for, yet why hasn't it taken off?"*

Rose believes there are two main reasons for it, the first being lack of supply of the diverse seaweed seeds that are available. *"But I think the main one is that there is some sort of uncertainty especially as the food industry is fairly conservative and wary of these sorts of weird, new, wonderful products and it's taking them time to really latch on to it,"* he said.

Not for everyone?

Seaweed is already used by companies such as Eat Balance and Batchelors in their salt-reduction efforts. It is usually done on a fifty-fifty basis, replacing half of the salt in a product. *"It's very versatile; it's used in bread, baked goods, ready meals etc. Whilst it's not exactly like sodium chloride it adds a lot of flavour to food and also*

it's been shown to extend shelf life, which is what salt is often used for. It's multifunctional even just in salt replacement," said Rose.

On top of that seaweed is much lower in sodium (3-3.5%) compared to about 46% in sodium chloride. And that is what the companies are trying to reduce in their salt-replacement efforts. So where is the 'but'? *"It won't replace all salt because it's not soluble, which for some applications salt needs to be; it's green, so if it's a clear product it's not necessarily applicable. So there are things that you would have to compromise on or it just won't be suitable,"* Rose said. *"But for many applications it's very good and the signs are actually very positive that it will go very big very soon,"* he added.

❁❁❁

Functional foods market is expected to grow 25% by 2017: Leatherhead

25-Nov-2014 Food Navigator

The global functional food market is forecast to reach $54bn (€43bn), an increase of 25% compared to the last available data from 2013, says Leatherhead Food Research.

According to the Leatherhead report, energy drinks as well as products aimed at improving mood maintained their popularity, with a 27.1% market share for the countries analysed. However, products offering other health claims such as those addressing cognitive and mental decline as well as eye health are also growing in importance. The forecast applies to products matching a strict market definition, i.e. those making functional health claims. *"Much of this growth is expected to be driven by ongoing concerns over worldwide obesity levels, together with the development of food and beverages offering benefits such as satiety,"* Jonathan Thomas from Leatherhead told
NutraIngredients. Indeed, the report suggests that the US is expected to be the fastest growing market - overtaking Japan as the world's largest market for functional foods.

Meanwhile the situation is Europe is a bit more complex with stricter regulations regarding health claims. *"As a result, more manufacturers within the wellness foods arena have been moving towards 'softer' health claims, which carry more general health and wellness messages,"* said Thomas. *"Sales of functional foods are also vulnerable to economic circumstances, given the fact that they typically command higher prices. Also, some sectors appear to be reaching maturity,"* he added.

A functional future?

The Leatherhead report showed that the despite the challenges, many consumers believed functional foods could resolve some of the health problems. *"Leatherhead research carried out for the report indicates that although less than a quarter (23%) of UK consumers are inclined to believe the health claims typically made by functional foods, three in ten are of the opinion that these types of products can play a major role in helping to combat some of the health problems facing society today, such as growing obesity levels,"* said Thomas.

While the report shows a strong market demand for functional drinks and mood related products, and growing demand for solutions to the obesity crisis, the situation does not look so good for products offering immune support – which represented $1bn (€0.8bn).

❁❁❁

Health and sustainability goals entails trade-offs

01-Dec-2014 Food Navigator

Pursuing health and environmental sustainability goals at the same time requires trade-offs, argues an Aarhus University associate professor in *Current Opinion in Food Science*.

Jessica Aschemann-Witzel, of the university's MAPP Centre for Research on Customer Relations in the Food Sector, claims that there are synergies between healthy eating and sustainability, but there are also times when pursuing one of these goals may adversely impact the other.

"Understanding and acknowledging the trade-offs that consumers might encounter or perceive is important in order to avoid that policies pursuing one goal are negatively impacting the other, and instead ensure they are mutually supportive," she wrote in the opinion piece.

She gives the example of advice to increase fruit and vegetable consumption for good health, while these crops have high losses in production and retail, and a large amount of wastage at the consumer level. Food miles associated with fruits and vegetables may also be relatively high, due to their seasonality.

"A consumer prioritising self-centred motives might refrain from choosing products that are described as more sustainable, if a trade-off is assumed to exist between a self-centred motive such as taste, health, or low price and an attribute that should be of benefit to the broader society," she wrote.

However, healthy eating advice to increase intake of plant-based foods while decreasing animal-derived and highly processed foods could lead to a net benefit for the environment too, with lower associated levels of carbon emissions.
"It has been found that the concern about 'food miles' is overrating the relative environmental impact of transportation: for most foods, the share of transportation is dwarfed by the crucial impact of the production stage, unless, however, transportation is via air. Furthermore, using less highly processed foods in the diet should, apart from being healthier, also be relatively more environmentally friendly due to lower energy use and possibly less package material needed," she wrote.

She added that overeating is one of the biggest problems for both health and the environment, and eating "just the right amount" would be beneficial from both perspectives.
❁❁❁
Medical food to grow by 30% as firms learn how to appeal to patients
04-Dec-2014 Nutra Ingredients

New analysis from Frost & Sullivan has found that the global medical foods market will grow by one-third by 2018, with Asia-Pacific driving this surge.

Medical foods are often confused with dietary supplements and functional foods, which are neither targeted for specific disease conditions nor require medical supervision to be administered. While regulations in the United States and Europe have clearly defined medical foods, those in other parts of the world are still under development. Recently, however, Australia and New Zealand have begun to regulate medical foods, a move that now puts pressure on other markets to improve their regulatory environment.

Asia-Pacific holds huge untapped market potential, though to penetrate it, Frost & Sullivan's report urges companies to strengthen their research capabilities, invest in differentiating their products regionally, and focus on innovation.

Up by one-third
The global medical foods market earned revenues of US $9.36bn last year and estimates this to reach US$13.34bn in 2018. The Frost & Sullivan report considered areas of medical foods in critical care and trauma, as well as oncology, diabetes, metabolic, digestive, immune, cardio-vascular, musculo-skeletal, and cognitive and CNS health.
Growing healthcare expenditure and rising public health consciousness are driving the global medical foods market. With life expectancy and disease incidence rates going up, the number of people receiving medical attention is expanding, boosting the volume base of the medical foods market.

"*Interest in clinical nutrition as a means to treat diseases is gaining pace, fuelling the demand for medical foods in many countries*," said Frost & Sullivan Chemicals, materials and food senior research Analyst Aparna Balasubramanian. "*While diabetes, oncology and metabolic health are currently the most significant application areas, immune and cardiovascular health are promising segments for future growth*."

Building awareness

However, drug-based therapies are still the dominant form of disease treatment and supplementing them with medical nutrition is yet to gain prominence in many parts of the world. Moreover, medical foods for non-fatal diseases such as diabetes are ignored by many sections of the population. Comparatively, the consumption of medical foods for life-threatening conditions such as cancer is higher. Another challenge for market participants in many developing countries other than the Philippines and Vietnam is a lack of awareness by physicians of the segment's ability to accelerate recovery improve the well-being of patients. Once manufacturers start focusing on building physician and end-user awareness on medical foods, the market will inch towards its true value, Frost & Sullivan said.

❁❁❁

Phood booed: Why big pharma fails at functional food

20-Nov-2014 Food Navigator USA

Faced with mounting difficulties in their drug businesses, many pharmaceutical manufacturers are looking at getting into functional foods and beverages, notes food marketing expert, Julian Mellentin in this guest article.

It's not a new strategy. Many times already, 'big pharma' has focused on nutrition. And in almost all cases these forays have turned into disasters. One of the most notable was Novartis' disastrous Aviva Life range of functional foods and beverages, which was pulled from the market within three years.

Another was Johnson & Johnson-owned McNeil's failure in cholesterol-lowering foods. McNeil mistakenly believed that a cholesterol-lowering food - Benecol - backed by multiple clinical studies and carrying an approved health claim could become a mass market success.

McNeil invested around $100 million (€79m) in a US market launch. The launch got sales of $30 million (€24m). McNeil probably never got a return on its investment and the license was sold back to brand owner, Raisio. Still, pharma companies believe that they have competitive advantages in functional foods. Here are the two common beliefs:

1. Science

This is what we have heard pharma execs say: *"Drug companies have unmatched research capabilities – this matters particularly in Europe, where the European Food Safety Authority (EFSA) requires a standard of proof that is close to that required for drugs. It will matter more in the US also." "Drug companies have vastly more and superior experience in, and knowledge of, how to conduct effective clinical trials."*

2. Regulatory know-how

"Pharma companies have significantly greater expertise than food companies in navigating through regulatory regimes."

However, if these ever were competitive advantages, they are no-longer. Major food companies already have a track record of creating or buying science that enables them to secure health claims. One example is Mondelez Belvita Breakfast Biscuits – one of the most successful brands of recent years. Supported by over 20 clinical studies, it has secured a health claim approval for a *"sustained energy"* benefit.

And science is an accessible commodity: There are tens, even hundreds, of universities and research organisations offering their services to the food and beverage industry. They undertake clinical studies and help build dossiers of evidence. Increasingly companies collaborate with a wide range of third party researchers to conduct research that would in the past have been conducted in-house.

Research is often a service provided to food and beverage brands by their ingredient suppliers, who deliver not only ingredients but proof of efficacy and validity of claims, final product concepts and formulations and regulatory advice.

Such companies range from the large to the small, from Beneo (a major supplier of dietary fibres) to Carbery (a mid-size Irish supplier of dairy proteins).

Competitive disadvantages
In fact, pharma companies have several competitive disadvantages: Pharma companies mostly do not own food brands with health credentials that are valid in the mind of the consumer.

1. They could buy such brands, but they would need to be run at arms-length if they are not to be smothered by the corporate culture.
2. Or they can launch new brands. But this is high risk, the growth curve is very low and the long wait for breakeven and a positive ROI is more than most pharma companies realise.
3. Competing food and beverage companies are often world-class at functional foods. One example is New Zealand dairy group Fonterra. Its high-calcium milk brand Anlene is a clinically-proven product that actually works, backed by a sophisticated, focused, consumer communication effort. As a result the brand has retail sales in Asia in excess of $600 million (€478m) and a 50% share of the high-calcium milk market in many countries - despite selling at a 100% price premium.
4. Fragmented markets, filled with an ever-greater proliferation of niches and a host of dynamic, start-up brands that are close to the consumer, may be the biggest challenge to lumbering giants such as pharma companies.
5. It's often claimed that pharma companies can be a force in functional foods. That's not going to happen. Their track-record – with one or two exceptions - is largely one of failure. If you want to see the future of functional food, look down at the small entrepreneurial brands, operating under the radar, not up at pharma giants.
❁❁❁

Food Safety & Regulatory News

Calorie labelling: Coming to a restaurant, grocery store, and theatre near you
The long-awaited final regulations for calorie labelling were released on Dec. 1, 2014. These regulations come 4+ years after the law requiring them passed as part of the Affordable Care Act. In a new *ePerspective* post, Jason Block, Assistant Professor and Associate Director of the Obesity Prevention Program, Dept. of Population Medicine, Harvard Medical School, offers a look at the final standards and his opinion on their potential impact, both on consumers' decisions and foodservice establisments' future formulations.

Despite early signals that some food establishments might be exempt, the final regulations state that fast-food restaurants, full-service restaurants, cafeterias, grocery stores, movie theatres, bakeries, convenience stores, vending machine operators, and yes, bowling alleys must comply. Block explains that several municipalities implemented calorie labelling years ago, so their experiences have provided preliminary insight into whether calorie labelling might work to change what people buy and eat. He notes that evaluations of calorie labelling show mixed results.

However, Block believes that any changes, even small ones, could have large effects across the U.S. population. Perhaps most important are responses of food establishments and their suppliers. Establishments might reformulate their products to keep the calorie numbers down. In addition, the widespread posting of calories also may bring greater transparency to the concept of calories, helping consumers to better estimate the calories in foods, a task that has been difficult for most. Read Jason Block's full *ePerspective* post for what to expect when the standards are implemented in 2015 and what impact they might have on the marketplace in years to come.

IFT Weekly December 17, 2014
❁❁❁

More knowledge needed to ensure safe use of botanicals in food

Science Daily December 22, 2014

The challenges related to assessing the safety of botanicals in foods and food supplements and regulating their use were highlighted at a conference held in Denmark in November 2014. The conference identified a need for more data to be generated on the risks botanicals pose to human health. Participants also called for harmonization of approaches and systems between countries so that scientific information can be easily shared supporting the safe use of botanicals and paving the way for greater cross-agency cooperation. The conference was organised by the National Food Institute, Technical University of Denmark along with the French institute for risk assessment, ANSES, and the German Federal Institute for Risk Assessment, BfR.

Botanicals and preparations derived from plants, algae, fungi or lichens have become widely available to consumers worldwide in the form of food supplements. A trend has also emerged where people collect botanicals in the wild for use in ordinary food. However, some botanicals or botanical preparations may pose a risk to human health and data on the safety and quality of many of their bioactive substances is limited.

This poses challenges both when carrying out risk assessments on the bioactive compounds and when managing these risks through the setting of rules to ensure agents are used in concentrations that are within safe limits. Safety assessment of botanicals and preparations thereof used in food supplements is not subject to EU regulation but to management by national food authorities in member states.

Presentation of available data and tools

Speakers at the conference presented currently available scientific knowledge on botanicals and outlined existing tools and systems that can assist in conducting risk assessments of bioactive agents. These included positive lists of botanicals that can be used in food supplements with specific conditions of use, and tools for structured safety assessments of products.

They also highlighted the challenges in communicating risks in a relevant way to different consumer groups and talked about the difficulties in setting and enforcing rules governing the composition and sale of food supplements containing botanicals.

Participants have applauded the initiative to hold the conference. An evaluation of the event has shown that most participants rated the conference programme highly, saying that they found it beneficial to their work.

More knowledge and better harmonization needed

Although the conference showed that progress is being made around the world to collate data on the relevant bioactive agents, it was made clear that data gaps relating to their safety and quality still exist. Concerns were also raised regarding the lack of scientific data on products containing several botanicals with respect to how these ingredients might react in combination.

It was suggested that part of the answer to filling these gaps could be creating positive lists of botanicals -- as some countries have done -- and harmonizing the way the safety of these products is assessed. Such an approach would help accelerate mutual recognition of data as well as products based on scientific information.

There were calls for more comprehensive information to be made available about the botanical constituents in food supplements -- e.g. scientific name, plant part used, how the ingredients are derived and recommended daily doses of individual ingredients. This would make the information immediately useful in the risk assessments of products.

Need for better knowledge among consumers

Examples of poisonings due to people mistakenly picking and consuming poisonous botanicals in the wild made it clear that -- contrary to popular belief -- natural does not necessarily mean safe. The examples highlighted the need for better public awareness of toxins in plants and the need for good botanical knowledge of the plants that are safe to eat and any preparation needed to avoid poisonings.

Medical professionals also need better awareness of negative health consequences related to consuming certain botanicals -- both acute effects and adverse effects due to prolonged use -- to ensure such effects can be reported and factored into risk assessments.

When communicating risks speakers at the conference showed the necessity of properly identifying the different target groups before deciding on the best messaging and channels both relating to risks associated with commercial products and plants collected in the wild.

Opportunities for cross-agency research

As a result of the conference the National Food Institute in Denmark, ANSES and the BfR have agreed to pursue research work in order to generate more of the required data that can support the safe use of botanicals in food and food supplements.

This work will take place under the framework of the institutes' existing cooperation agreement, which enables the institutes to exchange knowledge and experiences in the area of risk assessment and provides staff with a network of scientific colleagues in other countries, who work within their field of expertise.

❄❄❄

EU labelling law adds impetus to the sustainable palm drive
02-Dec-2014 Food Navigator

Changes to European labelling laws meaning the specific source of vegetable oil must be declared on pack could drive more food manufacturers to certified sustainable palm oil, according to one grower.

The European Food Information for Consumers Regulation (FIC), set to come into play December 13, will mean that 'vegetable oil' on ingredient lists will longer suffice. The specific source - i.e. sunflower, rape seed, palm - must be stated. Talking with European press at their Roundtable for Sustainable Palm Oil (RSPO)-certified site in Malaysia, the Danish brothers Martin and Carl Bek-Nielsen behind United Plantations said this development could be the fire needed to spur manufacturers to commit to purchasing certified palm oil.

Martin Bek-Nielsen, executive director for the company, told FoodNavigator: *"I think the labelling will make a big difference because brand manufacturers will then be forced either to switch away from palm or publicly promote palm. They'll have to make a decision."* While the labelling change does not directly reference on-pack RSPO approval, he said it would mean manufacturers would no longer be able to hide. *If there's palm in it and it's not RSPO-labelled then all the brand manufacturers are going to be criticised like anything and they will not want that."*

He envisioned greater consumer pressure on manufacturers and supermarkets when it was revealed just how many products contain palm oil - around 50% of all consumer goods. However pricing remained an issue and the brothers expressed frustration at manufacturer and even consumer reluctance to pay the price for certified commodities. Currently RSPO-certified palm oil accounts for 18% of the world's supply – but about 50% of that goes unsold as certified. Instead this oil is sold as normal 'uncertified' oil, with a price tag to match.

Making the distinction
Martin Bek-Nielsen conceded that the label law could go either way - make food firms reconsider their use of palm oil completely, or make them reconsider the type of palm oil they use. *"I don't know if we'll see a huge uptake in demand because some people will say: 'There's palm oil in it, we don't want palm.' But I think we'll see a wonderful, awaited move from not just saying it's either palm or no palm, towards distinguishing between palm or certified palm in a much more balanced manner."*

"We're not interested in people banning palm because there are some rogues cutting down the forest. We would like consumers to say at least: 'Okay we will ban palm if it's not sustainable palm. But we'll support palm if it's sustainable.'"

Putting your money where your mouth is
However the pair said there remained a disconnect between this European consumer demand for sustainability and traceability, and the commitments made to buying RSPO oil. They said they were never able to sell 100% of their stock at its official certified price, a value that accounts for the extra production and segregated supply chain costs incurred, adding roughly 10-15% to the final product price.

They said it was time certified producers were given their due; they had been told consumers wanted certified sustainable palm oil and had therefore jumped through various costly hoops to achieve these standards. Now it was time for food manufacturers to honour that and pay the premium price.

Carl Bek-Nielsen, vice chairman and executive director for the firm, said incentives would be key as currently smallholders would not take the financial risk of going certified without the guarantee of a premium pay back.

"What message does it send the growers? We want certified palm oil, but we don't want to buy it." He said if consumers were faced with two similar finished products on a supermarket shelf they would often chose the cheapest. He said more consumer understanding was needed, which could be helped by some kind of scorecard of producers rating their sustainability and traceability.

Yet ultimately this market tide depended on the commitments of big multinationals. *"You can't just push the growers, because the growers have been pushed a lot. Now it's time to push the demand. The supply is there now, but the demand is not."*

❁❁❁

Finland to provide specific dietary fibre information

01-Dec-2014 Nutra Ingredients

The Finnish Food Safety Authority Evira has introduced a method to better define the constituent parts of dietary fibre in foods.

Better analysis of specific dietary fibres – whether long-chain or short-chain, for example – will give the food industry, researchers, risk assessors and society as a whole more information about the specific composition of foods. The method involves weighing long-chain insoluble and soluble dietary fibre, while short-chain fibre is identified by chromatography.

Evira is the first Nordic authority to introduce a method to analyse dietary fibre, with results to be published according to their water solubility and size in the Finnish Food Composition Database, Fineli, over the coming year.

Helena Pastell, doctor of food sciences and senior researcher of the Chemistry and Toxicology Research Unit, explained that oligosaccharides (short-chain, very small components of dietary fibre) are found in rye, the basis of rye bread, which is one of the main sources of dietary fibre in Finland.

"Determined with this more specific analytical method, the total dietary fibre in rye has proved to be higher than previously," she said. *"Oligosaccharides, in particular, increase the growth of beneficial lactic acid bacteria in the large intestine. It is also important to remember that a product can be promoted as a high-fibre product if it contains at least six grams of fibre per 100 grams of product."*

Most Finns do not consume enough dietary fibre compared to the recommended 25 g per day for women and 35 g per day for men. However, different types of dietary fibre may have different health benefits. Insoluble fibre is important for increasing stool bulk, while soluble fibre has been shown to reduce blood serum cholesterol levels and limit spikes in blood sugar. Fibre is also thought to be protective against bowel cancer. *"A wider use of the method is important in order to produce comparable results on dietary fibre,"* Evira said. The analytical method is based on the definition of dietary fibre adopted by the Codex Alimentarius Commission.

❁❁❁

Study finds widespread adulteration of grape seed extract

01-Dec-2014 Nutra Ingredients

Grape seed extracts have been showing up in increasing numbers in the dietary supplements marketplace driven by their connection with blood pressure support and other health benefits. But are all of these extracts what they seem to be? A recent paper in the journal *Food Chemistry* raises serious doubts.

Titled *"Chemical investigation of commercial grape seed derived products to assess quality and detect adulteration,"* the paper looked at 21 commercially available grape seed extract (GSE) supplements. GSE is a complex mix of proanthocyanidin monomers and oligomers and other chemicals, the authors noted. *"Given no standardized criteria for quality, large variation exists in the composition of commercial GSE supplements,"* wrote the paper's authors.

The authors said that the paper arose out of wider effort to evaluate GSE for the treatment of Alzheimer's disease and the mitigation of cognitive memory loss. A wide variability was found when vetting GSE vendors

during that process. The authors set out to develop a TLC technique to look at the 21 extracts (purchased from a variety of outlets, including online) to see whether any of them were adulterated. Peanut skin extract and pine bark extract are two other materials that contain similar proanthocyanidins (PACs). Using reference materials for peanut skin extract and pine bark extract, the authors submitted the 21 samples to the test. Their results were sobering.

Overall, the quality of commercially available GSE products was low. *"Very few of the commercial GSE samples contained an overall content of PACs and catechins at a level comparable to authentic GSE, which raises a serious concern,"* they wrote.

And adulteration was rampant. *"Overall six of the commercial samples could be considered seriously adulterated, perhaps counterfeit, while another five samples contained considerably less PACs and catechins than the remaining commercial samples,"* they wrote.

The six worst samples appeared to consist almost entirely of peanut skin extract. The adulteration issue notwithstanding, this could be a serious concern as peanuts are a very dangerous potential allergen, the authors wrote.

Surprising result

GSE adulteration has flown under the radar until recently, said Stefan Gaftner, PhD, chief science officer of the American Botanical Council. *"The first time I was made aware of that problem was early October at a botanical conference,"* Gafner told NutraIngredients-USA. *"I was surprised, because grape seed extract is already a side product of the wine industry, so I would think that plenty of grape seeds would be available. But there must be a financial incentive, so my conclusion would be there must be an even greater abundance of peanut skins."*

ABC is the forefront of industry stakeholders looking into the adulteration of botanical materials. ABC operates the
Botanical Adulterants Program in conjunction with the American Herbal Pharmacopoeia and the National Center for Natural Products Research.

Gafner said that while the adulteration of GSE cannot be condoned, it's not necessarily the case that the resulting product has no health benefits. *"I would say based on the chemistry, some of the benefits you get from grape seed extract you might also get from peanut skin extract. But with peanut skin extract, there are no studies I am aware of on their health benefits,"* he said.

And, curiously, Gafner said that GSE has itself been used as an adulterant. A Spanish study found cranberry extract that was adulterated with grape seed extract, he said. *"So it goes both ways; grape seed extract can be adulterated and grape seed extract can itself be an adulterant,"* he said.

More sophisticated tests

The paper's authors said more sophisticated tests are needed to detect this type of adulteration. *"Due to reliance on inferior proximate assays across the value-chain, adulteration can then go undetected by others downstream in the commodity chain, such as those involved in distribution, packaging, wholesale, and retail sales. The inherent problem is that many of these manufacturers, relying on inferior quality control procedures, do not know their products may be adulterated or counterfeit, leading to the perpetuation of low quality products in the marketplace.*

"The purpose of this study is to demonstrate the necessity of chromatographic techniques (TLC, HPLC, etc.) for the screening of grape seed extract for quality and adulteration. Only with chromatographic techniques can one differentiate between the components common to GSE, and peanut skin extract," they wrote.

❁❁❁