Sustainability in Dairy Industry

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Sustainable Development is development that **"meets the needs of the present without compromising the ability of future generations to meet their own needs."**

Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations.

Sustainability is important to make sure that we have and will continue to have, the water, materials, and resources to protect human health and our environment.

Case study: Sustainability @ Mother Dairy

Strengths of Mother Dairy on Sustainable Development is well captured in the Vision of the company which is **"Provide quality food and beverages to consumers at affordable prices while ensuring fair returns to the producers"**

The dairy and food processing industry relies significantly on natural goods as inputs for production of the final goods. For example milk, fruits and vegetables are used to manufacture products such as processed milk, milk powder, yogurt, fruit concentrates, pulp and preserves. Besides these inputs, the industry consumes electricity and water for processing and production. It also requires materials for packing of the final products and uses various modes of transportation to deliver the final goods to the consumers.

At Mother Dairy, the input constituting of milk, fruits and vegetables are processed/ fermented and packed at its production plants and supplied to the customers through its own booths run by concessioners and other channels in the retail sector. These raw materials are produced in the agricultural farms through the use of natural resources such as land, water, air and vegetation.

Besides environment, there is another aspect of sustainability that is pertinent to Mother Dairy operations. The production inputs are key products of the agricultural sector in India. These are largely procured from rural and quasi-urban regions of the country that are involved in their production at various scales. The company involves approximately 10,000 farmers, 120 farmers' associations, approximately 40 transporters and a fleet of approximately 300 vehicles operating on daily basis and few non-contracted vehicles. Hence, a large population is directly and indirectly affected by our operations. As a result, in addition to the environmental aspects, the sustainability approach also encompasses the social arena having an impact on economic and social sustainability of the larger community.

At Mother Dairy, sustainability is an integral value encompassing all three aspects namely economic, environmental and social sustainability. Endeavour to promote sustainability is ~~as~~ deep-rooted as the business model. Hence, this report is an attempt to collate our efforts towards sustainability in all three arenas in line with the already formulated goals. Moreover, it takes stock of the areas in which the organization needs to establish short and long term goals and prepare strategize in order to improve its sustainability.

In Short *"We Do Not Inherit the Earth from Our Ancestors; We Borrow It from Our Children"*

Sustainability Goals - Mother Dairy

- Improve Water efficiency a by 20% over three year period.
- Zero Discharge Unit - One unit in 18 months & Rest in Phases
- 100% Water Recharge by 2017-18 - All Plants
- Improve energy efficiency at processing units by 20% over three year period.
- Reduction in carbon footprint intensity 20% over three year period.
- All Processing units roof to be converted to roof top solar in 3 years.
- 10% packaging Material to be Bio degradable by the end of three years (2016-17)
- Availability of non-packaged milk to be extended to one more city by the end of five years

Actions in Place on Sustainability Goals

Mother Dairy continuously striving towards meeting the goals on Sustainability. In the continuation of its Sustainable journey, it works on every vertical of operations.

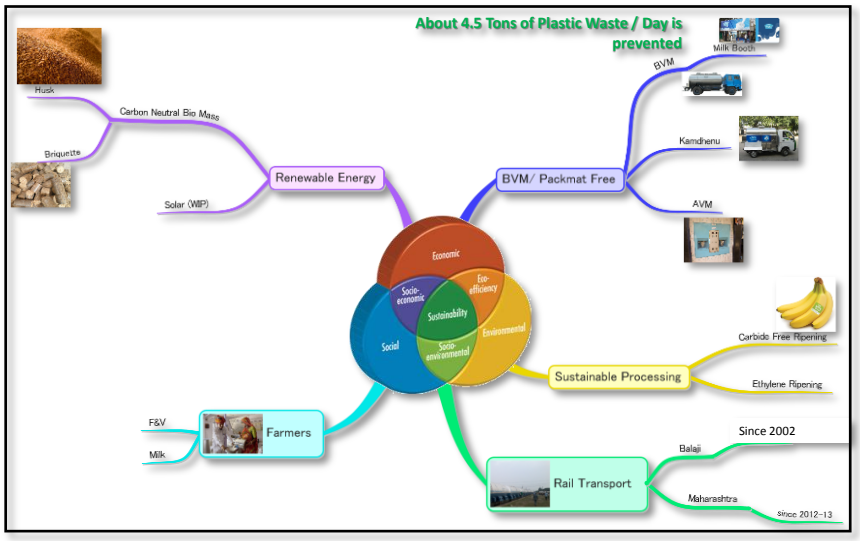


Fig 1: Sustainability at Mother Dairy

Sustainability begins with use of fuel such as briquette, husk and solar energy which is renewable energy. Milk and fruits and vegetables are directly sourced from farmers. Lucrative alternate employment opportunities are often not available in Indian villages, making dairying an attractive option for many villagers. Dairying is feasible even for the landless, which depend for fodder on common grazing and forest lands. Nearly 70 million Indian households hold a total of 98 million cows and buffaloes. A majority of milk

producers have one or two milch animals, and these small producers account for some 70 per cent of the milk production. On average, 22.5 percent of the income of rural households is contributed by milk.

Bulk Vended Milk is introduced to supply package free milk to the consumer, in Delhi since 1974. This model reduces plastic usages for primary packaging. Apart from Road Transport of milk, Rail transportation of Milk was introduced for effective & environment friendly transportation, since 2000 from Thirupati to Delhi and from Maharashtra, since 2012

Ripening of fruits is done using ethylene and is a carbide free process.

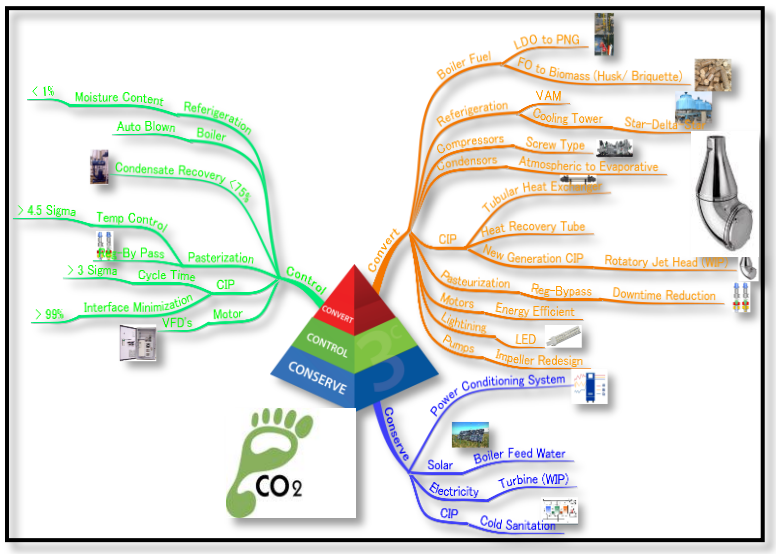
A recent report in Times of India has credited Mother Dairy with 'an industry first" for serving fresh lassi through vending machines. The innovation involved was the 'bag-in-box model', which allows delivery of fresh lassi straight from the plant to the vending machines.

The sustainability achievements can be summarized as (fig 1:):

- Sustainable energy
- Sustainable farming and returns to farmers
- Reduced plastic for packaging due to sustainable transport and vending machines

Mother Dairy strongly believes towards the conservation of natural resources. To utilize natural resources Mother Dairy follows below mentioned strategies; control, convert and conserve leading to reduction in carbon foot print (fig 2).

Each of these strategies are summarized as follows in figure



Control: Control of parameters in various systems such as pasteurization, condensate recovery, refrigeration, Cleaning in Place (CIP)

Convert: Change of various systems into energy efficient or fuel efficient ones such as lighting into LED, energy efficient motors, CIP to new generation CIP using rotary jet washing systems, fuel from LDO to briquette, VAM technologies for refrigeration etc.

Leading to the third **C** which is **"Conserve'**: Conservation of energy by using solar energy for boilers, cold sanitation for CIP, Use of turbines etc.

Fig 2: 3C's strategy for energy saving

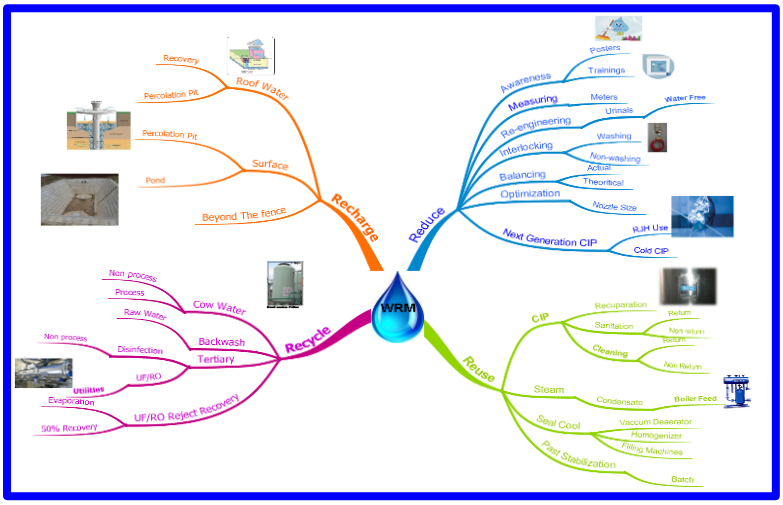


Fig 3: Water resource management

Water Resource Management: 4R Strategy & Actions

For water resource management 4R's strategy is followed (Fig 3). The R's are:

- **Reduce:** Reduction of water usage is carried out in different areas including CIP, increasing awareness by posters and training of personnel, Interlocking of machine, Use of water guns in house down section, Use of Heat Recovery Tube in CIP to eliminating final rinse step.
- **Reuse:** Water used in many functions is reused. This includes recovery of CIP- Pre Rinse water, Condensate, PPM Filling Machine Jaw Cooling Water etc.
- **Recycle:** Water is recycled with many ways, examples are Backwash Water Recovery System, COW water Recovery, CIP Rinse Recovery, Recycling of treated effluent through Tertiary Treatment etc.
- **Recharge:** Recharge of ground water is done by percolation of surface water and roof water harvest into ponds, percolation pits, Existing Tube wells, Recharge Trench etc.

CSR Policy:

Mother Dairy Vision, Mission, and Goals – On CSR:

Mother Dairy is committed to holistic development of the communities they serve. In the process, the company strives to create positive social, economic and environmental value for the socially and economically disadvantaged sections of society.

The core competencies of innovation and project planning are mobilized using ~~our~~ understanding of rural issues to deliver sustainable and high impact projects that benefit communities, particularly, in the vicinity of the company operations.

- Starting FY 2014-15, the company will comply with the provisions of section 135 of companies act 2013 and commensurate funds will made available for CSR programs, and report influence of CSR activities and economic surplus arising out of CSR activities will not constitute part of company's business profit

Focus Areas

Mother Dairy will focus on:

- ✓ Poverty alleviation, Women empowerment, Prevention of malnutrition with appropriate supplements
- ✓ Ensuring environmental sustainability and conservation of natural resources, with specific emphasis on water.
- ✓ Contributing to Prime Minister's National Relief Fund or any other fund set up by the central government for socio-economic development, if needed.

Rewards & Recognitions on Sustainability…

Some of the awards won by Mother Dairy for sustainability include

- ✓ 2nd best supplier award in 2012 partnered by Unilever South Asia
- ✓ Global best supplier award Unilever Hamburg
- ✓ Consecutive 2 nd year best supplier award by Coca-Cola in the mango pulp category

Mr. Nagarajan accepting award

Various awards won by Mother Dairy

(Article Based on Inaugural Address by Mr. Siva Nagarajan, MD Mother Dairy at Sustainability Seminar of PFNDAI in February 2015)

Food Safety and Standards (Food Recall Procedure) Regulations, 2015 (Draft)

Critical Analysis by Mr. Mohan V., Chairman, Regulatory Affairs, PFNDAI

The Food Safety and Standards Authority of India (FSSAI or the Food Authority or FA), in exercise of powers granted under Section 92(m) and pursuant to Section 28(4) of the Food Safety and Standards Act 2006 (the Act), has issued on April 22, 2015 **a** draft regulation titled Food Safety and Standards (Food Recall Procedure) Regulations, 2015 (the Regulation). Considering the importance of food safety, health of the consumers and the criticality of recall procedure one would have expected this Regulation long back.

The draft regulation is rather simple, comprising **17 clauses** divided in to **three Chapters** with **five Schedules** and confines itself to ensuring how the distribution / consumption of an unsafe food is contained in order to protect the safety of the consumers, through a structured recall process.

Objectives

The objectives of the regulations as set out in Chapter 2 is

a. to guide the Food Business Operator how to carry out a recall of an unsafe food in the quickest possible manner
b. to guide the FBO in establishing a written recall plan
c. to establish a complete process of recall, post-recall report, closure of recall process and follow up report to prevent recurrence of the same.

Definitions (Chapter-1)

While the definition of unsafe food is as defined by section 3(zz) of the Act, some of the major definitions are set out in Chapter-1;

A. "**public warning"** apart from the FA and CFS, an FBO too can issue a public warning provided the he has taken the prior approval of FA or CFS.

B. **"Recalling Food Business Operator" – in** the definition for the word "company" the word "a **person"……..** could be used.

C. "Recall Classification" may need to be adequately defined; the current definition ……..does not bring out the intent of the Regulation.

Scope of Food Recall Procedure (Chapter-2)

An FBO has to have an updated, written recall procedure to be shared with the State CFS/ FA as and when called for and the recall procedure should be part of the annual audit of the business.

The Regulation further provides for the **exemption to food service sector such as restaurants, caterers, takeaway joints etc.** from maintaining a written recall plan **unless** they are running multi outlet food business chains with integrated manufacturing and distribution network.

Food retailers too are exempted from the above unless they are also engaged in the manufacture, importation and wholesale supply of food. With the advent of e-commerce **/ web portals obviously they too should be made accountable as a wholesale distributor. Clarity is needed as regards who would be responsible for selling fruits and vegetables which do not carry any individual packing/ numbering but often is contaminated with artificial ripening agents / harmful chemicals? Also, how they would be tracked and recalled?**

While the Regulation exempts products like tobacco, liquor that carry health warning from being categorized as unsafe food for this purpose unless they are unsafe within the meaning of this Regulation).

Chapter 3- Food recall procedure

Initiation- This section requires the FBO to effect recall *suo motto* or on the direction of the CFS / Food Authority. The CFS / Food Authority on a complaint from almost anyone could also, after satisfying itself and consulting the FBO concerned, can order the FBO to recall. **What happens if the FBO refuses to recall / delays or abide by direction of CFS/FA? Regulation must provide. The CFS/ FA could order recall on its own invoking its powers under the Act.**

This section further requires the entire players in the distribution chain to participate in the recall process and submit prescribed reports to the Recalling FBO.

In case of Imports-

This section casts an obligation on the customs authority and the Food Safety Officer concerned to ensure any imported product that has been ordered for recall or rejection in any market (in the world??) , the same is "not disbursed" in the local market. **There has to be a mechanism in the FSSAI whereby such a recall happening elsewhere is tracked / arrangements are put in place where such information is exchanged between statutory authorities…**

The Regulation must also need to address grey market imports and who would be responsible in the event of unsafe food?

Section-6. Recall classification- not clear. While unsafe food is defined to be injurious to health under various circumstances, under this section the classification by the FSO basis whether such food would cause serious health problems including death. **More clarity is needed under this section as regards method of risk analysis and the classification**.

Section-7 Operation of Food Recall system:

a. FBO to maintain all relevant records along with batch number, details of suppliers, distributors etc, for ease of product traceability.

b. FBO to give **recall alert notification** to appropriate State / Food Authority per **Sch 1** within 24 hours of his coming to know about an unsafe product. The FBO need not wait for any approval for recall of the unsafe food. However, he needs to get clearance of the State CFS in the event he wants to resume distribution of the identified food product.
c. The same format along with other relevant details shall be used for informing the suppliers as well as downstream mfg. / distributor FBO's.
d. FBO shall forthwith stop production / distribution of the food under recall without waiting for any instructions from the FA to ensure public safety.
e. Shall carry out health hazard evaluation and classification.
f. Punishment for not intimating FA or not carrying out the recall instruction from FA, shall be as prescribed in the Act.

Recall Plan

The recalling FBO shall submit food recall plan per format in **Sch II** to the CFS at the time of actual recall after taking in to consideration the result of health hazard evaluation or classification. Any comments received from CFS/ FA shall be incorporated and acted upon.

Recall communication

a. Recalling FBO to be responsible for communicating to downstream FBOs.
b. The content, extent and mode of the communication to be commensurate with hazard of the product being recalled.
c. Downstream FBO's to communicate to their customers per format **Sch.III.**
d. The recalling FBO to issue a Public Notice per prescribed format in the affected area- thru' paid advertisement, press release, letters etc.

Other than Public Notice the regulation makes no mention about the Public Warning" as regards when they would be issued etc.

Recall status report

Recalling FBO to file status report in format **Sch.IV** with the State CFS at least every week.

Complete documentation of the food recall operation shall be maintained.

Food recovery

The recalled food shall be properly marked and stored. All relevant records of recalled food shall be maintained.

Recalled food can be released only after proper reprocessing / correction in consultation with CFS/ FA ensuring it is fit for human consumption. Else they need to be destroyed in consultation with CFS / FA and under its supervision. Proper records of destruction of recalled food product needs to be maintained.

Post Recall

FBO shall ascertain effectiveness of the recall needs to be ascertained- quantity of food sold / dispatched vs the quantity of food recalled and returned and would also investigate reasons leading to recall to prevent recurrence.

Termination of recall

Termination of recall to be in **Sch.V** to be made by recalling FBO. After satisfying and within 2 weeks of such request the State CFS / FA shall issue a written notification.

Follow up action

Recalling FBO to submit to CFS/ FA within 30days of conclusion of recall, a interim report detailing the reasons for the recall, , action taken for recall including publicity, quantitative details of products dispatched / sold and recalled back, steps taken to prevent such occurrence.

Responsibilities of the FBO, CFS and FA are a summary of what has already been explained earlier which includes

a. **FBO**-intimation, submission of reports, initiating recall maintenance of records and safe disposal of unsafe food-
b. **CFS-** instructing, giving direction / supervision / audit of records and / issuing public notice and keeping FA informed.
c. **FA**- to provide guidance and occasional oversight; maintenance of website with UIC for products recalled for tracking and benefit of FBO and consumers.

The schedules comprise the following-

Schedule-I- intimation by FBO to the CFS/ FA about intent to recall unsafe food

Schedule-II- food recall plan to be submitted by FBO to CFS/FA

Schedule-III- intimation from recalling FBO to downstream FBOs about the unsafe food being recalled.

Schedule-IV- Recall status report to be submitted by recalling FBO

Schedule-V- request by FBO to CFS/UA for termination of recall process

Observations / suggestions

a. Whereas The Regulation is for recall of food that is unsafe, one is not sure if the same Regulation would apply for recall of food that is not in compliance with the Act, Rules and regulations as contemplated under section 28(1) of the Act but otherwise safe.
b. The choice of words (e.g. “disbursed” instead of distributed, “amount of food” instead of quantity or # of packs) could be improved.
c. Classification / gradation of unsafe / hazardous food - how it has to be done, (small, moderate and serious) and how each one has to be dealt under the recall process has not been explained. This is critical as time is of essence and the safety / restrictive measures

suggested should be proportionate and no more restrictive of trade than required to achieve appropriate level of health protection.

d. Importer- if he is not the manufacturer-his controlling recall process, indentifying the cause of unsafe- is a grey area not dealt with adequately,
e. how to ensure safe recall without causing panic through Public Warning / Notice – needs to be fully addressed;
f. Public Notice should contain what the consumer is supposed to do if he has already consumed the unsafe food? Medical supervision for treating moderate / serious injury is a must and the public notice / warning must carry that..
g. An unsafe product which is likely to cause serious or moderate injury - how the heath care system need to be involved through proper coordination;
h. Whether the FBO can continue to mfg the same brand / product in subsequent batches if they are not unsafe- needs to be clarified.
i. Enough differentiation should be there for Punishment – between those responsible for deliberate / negligence behaviour and those due to bona fide action.
j. The Regulation is silent on the FBO carrying out mock recall procedure on regular basis so he can deal with any such eventuality better.
k. All formats should be brought under schedules - like Public Notice/Interim report on follow up action.
l. A format of "public warning" could also be provided in the Schedule to ensure clear and measured tone without causing any panic.

The draft Regulation seems to have been brought in a hurry and may require significant improvements.

Research in Health & Nutrition

Fruits, Not Veggies, Decrease Obesity Risk in Women
May 05, 2015 Food Product Design

An interesting study for the ladies was recently published in the Journal of Nutrition. The study found fruit, not vegetables and fiber eaten by middle-aged and older women with a normal BMI is associated with lower risk of becoming overweight or obese.

The researchers' goal was to investigate whether intake of fruits, vegetables and dietary fiber was associated with weight change and the risk of becoming overweight and obese. They studied 18,146 women aged 45 or older from the Women's Health Study free of cardiovascular disease (CVD) and cancer with an initial body mass index (BMI) of 18.5 to less than 25 kg/m.

During a mean follow-up of 15.9 years, 8,125 women became overweight or obese. Intakes of total fruits and vegetables, fruits and dietary fiber were not associated with the longitudinal changes in body weight, whereas higher vegetable intake was associated with greater weight gain. No association was observed for vegetable or dietary fiber intake. The association between fruit intake and risk of becoming overweight or obese was modified by baseline BMI where the strongest inverse association was observed among women with a BMI less than 23 kg/m.

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New soybean may impact baby formula

Ingredients Network.Com May 13 2015

Scientists from the University of Arizona (UA) and University of Illinois have created a new variety of low-allergenic soybean, which, they say, could have an impact on baby formula and animal feed. In the United States, nearly 15 million people and 1 in 13 children suffer from food allergy, they note.

Soybeans are one of the eight foods regulated by the Food Allergen Labelling and Consumer Protection Act, or FALPA. Soybean is a major ingredient in many infant formulas, processed foods and livestock feed used for agriculture. Soybeans contain several allergenic and anti-nutritional proteins that affect soybean use as food and animal feed.

A decade-long effort by University of Arizona scientists Monica Schmidt and Eliot Herman and University of Illinois scientist Theodore Hymowitz has yielded a new soybean with significantly reduced levels of three key proteins responsible for both its allergenic and anti-nutritional effects. The work is described in a paper published online in the journal Plant Breeding.

“We have created a low-allergen and low anti-nutritional inhibitor soybean using conventional breeding methods,” said Herman, a professor in the UA School of Plant Sciences, which is part of the UA’s College of Agriculture and Life Sciences.

Back in 2003, Herman, then at the U.S. Department of Agriculture, made national headlines when he and his colleagues addressed P34 as the soybean’s key allergen, and genetically engineered it out of the crop. Although the new soybean may have been less likely to cause allergic reactions, testing was impeded by its transgenic production especially in key applications such as infant formula.

To circumvent the issue, Herman, Schmidt and Hymowitz set out to create a similar soybean using conventional breeding methods. After screening 16,000 different varieties of soybean for the desired trait, they found one that almost completely lacked the allergen P34. The team stacked the P34 null with two varieties previously identified by Hymowitz that lacked soybean agglutinin and trypsin inhibitors, proteins that are responsible for the soybean’s anti-nutritional effects in livestock and humans.

“We really believed in this goal and wanted to produce an enhanced soybean that could be used,” said Herman, who also is a member of the UA’s BIO5 Institute. “That became the motivation for using conventional breeding rather than the transgenic approach.”

After nearly a decade of crossbreeding each variety to the soybean reference genome called Williams 82, the team has produced a soybean that lacks most of the P34 and trypsin inhibitor protein, and completely lacks soybean agglutinin. Beyond these characteristics, the soybean is nearly identical to Williams 82. They’ve dubbed the new variety “Triple Null.”

“We think this will be embraced by many, whether they prefer conventional breeding or transgenic methods of food production,” said Schmidt, an assistant professor in the School of Plant Sciences and a member of the BIO5 Institute. “It can be grown organically, with pesticides, and although conventional itself it could be transformed to add other producer or consumer traits.”

In collaboration with scientists at Purdue University, tests are planned to evaluate the efficacy of the low-allergen soybean in swine. The Purdue team has bred a line of swine that develops a strong allergenic response very similar to that of human infants allergic to soybean formula. The swine studies will enable testing of Triple Null and enable new approaches to mitigate soybean allergies in humans.

“Food allergy is a huge and growing problem for children. In Arizona, teachers are required to undergo training in how to respond to an emergency situation where a child has a significant response to an allergen exposure,” Herman explained. “We hope this work will offer a new approach to developing low-allergen foods and help to bend down the curve of growing food allergy.”

Triple Null also has applications for livestock and agriculture with soybean being the primary global input of vegetable protein for animal feed. A growing use of soybean is in aquaculture, which produces more than 50 percent of consumed seafood, with this number expected to rise to 75 percent by 2030. Before soybean is

used in feed, it must undergo a heating process to eliminate anti-nutritional proteins such as trypsin inhibitors and soybean agglutinin that add to cost — the very components that Herman, Schmidt and Hymowitz have effectively eliminated.

"All over the world, people are consuming more meat," Herman said. "At the current rate, we'll have to more than double the amount of animal feed by the year 2050. This means that several hundred million more tons of soybean will need to be processed before it can be fed to animals." By pre-emptively knocking out the anti-nutritional components of soybean, the researchers hope Triple Null can eliminate the need for extra processing and make creation of animal feed more efficient, potentially developing a raw soybean as animal feed.

"By the year 2050, animal feed needs are expected to rise 235 percent," Schmidt said. "We're hoping that our soybeans can help with this. It's great to know that they can have an impact."

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Fortified sauces may offer nutritional benefit for the elderly

A study published in the *Journal of Food Science* shows that fortifying sauces with micro- and macronutrients may offer an approach to improving energy intake for hospitalized older people.

The researchers fortified tomato, gravy, and white sauces with a micronutrient blend at 0.1% (w/w). The premix (100 mg) contained iron (6 mg), zinc (6.4 mg), riboflavin (0.8 mg), vitamin B6 (0.86 mg), folic acid (134 µg), vitamin C (26.6 mg), and vitamin D (6.6 µg). In addition, the sauces were enriched with potassium and magnesium. The fortified sauces had higher nutritional value than the conventional ones. For example, the energy content of the fortified tomato, white sauce, and gravy formulations were increased between 2.5- and 4-fold compared to the control formulations. Sensory profile was assessed by a trained panel. Additionally, a group of healthy older volunteers evaluated the hedonic liking of the fortified sauces compared with standard sauces.

The researchers found that the healthy older consumers preferred the fortified tomato sauce compared with unfortified. There were no significant differences in liking between the fortified and standard option for gravy. They did find limitations in the extent of fortification with protein, potassium, and magnesium, as excessive inclusion resulted in bitterness, undesired flavors, or textural issues. This was particularly marked in the white sauce to the extent that their sensory characteristics were not sufficiently optimized for hedonic testing.

The researchers conclude that "the development of fortified sauces is a simple approach to improving energy intake for hospitalized older people, both through the nutrient composition of the sauce itself and due to the benefits of increasing sensorial taste and lubrication in the mouth."

IFT Weekly May 13, 2015

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Dark chocolate may increase alertness

A study published in *NeuroRegulation* shows that dark chocolate may improve attention. The study, sponsored by The Hershey Co., is the first to examine the acute effects of chocolate on attentional characteristics of the brain and the first-ever study of chocolate consumption performed using electroencephalography, or EEG technology. EEG studies take images of the brain while it is performing a cognitive task and measure the brain activity.

Historically, chocolate has been recognized as a vasodilator, meaning that it widens blood vessels and lowers blood pressure in the long run, but chocolate also contains some powerful stimulants. The researchers

wanted to investigate if people who consume chocolate would see an immediate stimulant effect. They performed the EEG study with 122 participants, aged 18–25. The researchers examined the EEG levels and blood pressure effects of consuming a 60% cacao confection compared with five control conditions.

The results for the participants who consumed the 60% cacao chocolate showed that the brain was more alert and attentive after consumption. Their blood pressure also increased for a short time. The most interesting results came from one of the control conditions, a 60% cacao chocolate that included L-theanine, an amino acid found in green tea that acts as a relaxant. For participants who consumed the high-cacao content chocolate with L-theanine, researchers recorded an immediate drop in blood pressure.

The researchers hope the results of this study will encourage manufacturers to investigate further and consider the health benefits of developing a chocolate bar made with high-cacao content and L-theanine.

IFT Weekly May 13, 2015

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Dietary carotenoids linked to lower type 2 diabetes risks in healthy adults
NutraIngredients – USA, 01May2015

High dietary intakes of alpha and beta-carotene are associated with reduced type 2 diabetes risk in generally healthy adults, says data from the European Prospective Investigation into Cancer and Nutrition Netherlands (EPICNL). Increasing intakes of beta-carotene in the diet were associated with a 22% reduction in diabetes risk, according to findings published in *Nutrition, Metabolism and Cardiovascular Diseases.*

Researchers from the University Medical Centre Utrecht and the Dutch National Institute for Public Health and the Environment (RIVM) also report that the highest intakes of alpha-carotene were associated with a 15% reduction in diabetes risk.

"Carotenoids are known to have antioxidant functions, which may underlie the observed inverse associations with diabetes," they wrote. *"It has been suggested that antioxidants such as carotenoids might be effective in reducing diabetes by reducing oxidative stress. Of all carotenoids addressed in this study, beta-carotene is known to be a strong antioxidant, which may explain the observed association with diabetes in our study. "We also found an inverse association with alpha-carotene, which could possibly be explained by the high correlation between beta-carotene and alpha-carotene."*
The study was limited to dietary intakes, and did not consider supplemental intakes of carotenoids. The study also only shows correlation and not causation.

The Dutch researchers analyzed data from 37,846 people participating in the European Prospective Investigation into Cancer and Nutrition Netherlands study. The mean total carotenoid intake of the participants was 10 mg/day. During the 10 years of follow up, the researchers documented 915 new cases of type 2 diabetes.

After crunching the numbers, the researchers found that greater dietary intakes of alpha and beta-carotene were both associated with significant reductions in the risk of diabetes. On the other hand, other carotenoids, including beta-cryptoxanthin, lycopene, lutein and zeaxanthin did not affect diabetes risk.

Commenting on the potential antioxidant mechanism and a lack of an association for other carotenoids, and lycopene in particular, the researchers stated: *"Even though lycopene was a major contributor to total carotenoid intake, we did not find an association of lycopene with diabetes risk. It is unclear why lycopene shows*

no association with diabetes in the present study. Relative validity for lycopene was higher than for beta-carotene, the bioavailability for lycopene and beta-carotene are comparable, and the range of intake for lycopene was wider than for beta-carotene.

Therefore this unlikely explains why we were unable to find an association of lycopene with diabetes. The higher completeness of the food database for beta-carotene values of foods (92% for vegetables; 98% for fruits) than for lycopene values of foods (79% for both vegetables and fruits) may partly explain these differences."

The study's findings were welcomed by Bryan See, regional product manager for ExcelVite Inc, which supplies natural mixed carotenoids complex to the market that contains high levels of both alpha and beta-carotene. *"This study shows us that among the six common dietary carotenoids, consuming high levels of alpha-carotene*
and beta-carotene leads to reduction of type 2 diabetes risk in healthy men and women, at the same time, smoking status does not alter the benefit," he said.
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Fish-liver oil when younger may reduce heart disease risk when older
27Apr2015 NutraIngredients

Consuming fish liver oil three times weekly in adolescence or midlife may reduce a woman's chances of coronary heart disease later in life, say Icelandic researchers.
The AGES Reykjavik Study looked at 3326 women aged 66–96 years. Coronary heart disease (CHD) status was recorded at the beginning of the study as was information on fish and fish-liver oil consumption during midlife and adolescence retrospectively.

"Compared with women with no intake of fish-liver oil in adolescence or midlife, women who consumed fish liver oil at least three times weekly in adolescence or in midlife had a decreased risk of CHD," according to the results published in the journal *Public Health Nutrition.*

The same could not be said for fish consumption. No associations were seen when comparing those who consumed more than two portions of fish a week with less than two portions per week in adolescence or midlife. Coronary heart disease was detected in 7.9% (234) of the women and 67% of the participants had high intakes of fish-liver oil in both adolescence and midlife. The researchers from the University of Iceland, the Icelandic Heart Association, Harvard School of Public Health and the US National Institute on Aging said the results pointed to a lifelong nutrition approach to reducing CHD risk in older women.

"With few existing studies on early life dietary factors and CHD, our study provides important evidence for the potential preventive role of fish-liver oil consumption throughout life on the development of CHD in women. Our results suggest that moderate prolonged fish-liver oil consumption initiated in early life may be protective against the development of CHD in women," they wrote. They conceded that the data may have suffered due to the recall method used to gather data.
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Herbal blend shows body fat reduction potential
28Apr2015 NutraIngredients

A botanical blend has been shown to reduce body fat by 5% compared to placebo in a study published in the *Journal of Functional Foods.* The 6week study found the effect was caused by the blend of *Coleus forskohlii*, *Salacia reticulata*, and *Sesamum indicum* inhibiting pancreatic lipase, an enzyme that works on fats in the digestive system.

Led by Dr Vladimir Badmaev from American Medical Holdings and featuring researchers from Japanese, Chinese and Taiwanese institutions, the blend was administered at 1000 mg per day to male and female adult subjects with a body mass index (BMI) between 25 and 30. Those receiving the blend (in four 250 mg soft gels per day) showed higher lipase inhibition, more so with the three extracts together than apart, compared to placebo.
"The in vitro addition of S. indicum *to the formula was found to synergistically assist inhibition of the pancreatic lipase in a lower dose range, while moderating the pancreatic lipase inhibition in a higher dose range,"* the researchers wrote. *"This dual mechanism of* S. indicum *was postulated as a safety mechanism preventing any potential side effects resulting from excessive inhibition of pancreatic lipase activity."*
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Micro-nutrient-dense bar shows broad health improvements for overweight/obese adults

NutraIngredients USA, 29Apr2015

A micronutrient and fibre-dense supplement bar may improve metabolism in overweight/obese but otherwise healthy adults, says a new study from the Children's Hospital Oakland Research Institute (CHORI). Two months of consumption of the CHORIbar, conceived by Drs Bruce Ames and Mark Shigenaga, was found to improve metabolism in ways that are consistent with reduced risk of type 2 diabetes and cardiovascular disease, according to findings published in the *FASEB Journal.*

"Two-month consumption of the nutrient bar did not make the overweight/obese (OW/OB) lean or completely correct unhealthy metabolism, but it did begin a process of favourable metabolic change," wrote the authors, led by Dr Joyce McCann. *"The fact that almost all statistically significant favourable changes occurred in the subgroup of the OW/OB with less chronic inflammation suggests an explanation for why some OW/OB have difficulty losing weight. This study highlights the power of food based, targeted, dietary interventions as alternatives or adjuncts to the use of drugs to treat obesity and associated metabolic dysregulation."*

A decade in development
The CHORI bar was developed with the intention of filling nutrient gaps with components present in the bar in normal dietary amounts. Most people do not eat an optimally nutritious diet – particularly the obese. This results in unhealthy metabolism, which not only diminishes vigor, but increases future risk of many diseases. While poor diets contain much that is not healthy (e.g., too much salt, sugar), they also are missing or deficient in a number of important components (e.g. vitamins/minerals, omega3 fatty acids, fiber) necessary for healthy metabolism. Considerable evidence in the scientific literature supports the idea that simply supplying missing or deficient dietary ingredients will improve metabolism.

The new paper compiled data from three two-month clinical trials that included a significant number of overweight/obese individuals. These trials were conducted over a 4year period using very similar bar formulations. Dr McCann and her coworkers included data from 43 healthy lean and overweight/obese adults, who served as their own controls. The participants were asked to eat two bars each day for eight weeks (composition of the bars is shown in the table below right).

Results showed that, in overweight/obese people with lower baseline inflammation levels, the CHORIbar was associated with significant average reductions in weight of 1.1 kg and waist circumference of 3.1 cm. The bar was also associated with significant decreases in diastolic blood pressure of 4.1 mmHg and heart rate of 4.0 beats per minute.

Blood lipid levels were also significantly improved, with triglycerides reduced by an average of 72 mg/dl and HDL2b levels increased by an average of 303 nM. Insulin measures also improved, with a measure for insulin resistance decreasing by an average 0.72 over eight weeks of CHORIbar consumption, while insulin levels also fell by an average of 2.8 mU/L.

In overweight/obese people with higher baseline inflammation levels, improvements were only observed in inflammation at week two, and heart rate at week eight. Commenting on the potential mechanisms, the authors cited potential beneficial effects on mitochondrial stress and impaired gut wall integrity. *"Both of these conditions are common in the obese, and both are linked to poor diets and to insulin resistance and inflammation,"* they wrote.

"Bar-induced reduction of mitochondrial stress and improved gut integrity would be expected to have multiple beneficial consequences similar to the metabolic improvements observed in this study. The restoration of an internal metabolic environment that manifests a leaner metabolic profile would also allow the metabolic flexibility required for weight loss and clearance of ectopic adiposity."

"Consumption of the bar for two months also reduced chronic inflammation, and initiated a reduction in weight and waist circumference," they wrote. *"Decreased inflammation and improved weight and weight distribution can lower the risk of many chronic diseases,"* they concluded.
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Probiotic ice cream may boost oral health for kids
NutraIngredients USA, 28Apr2015

Consuming a functional ice cream formulated with *Bifidobacterium lactis* Bb12 and *Lactobacillus acidophilus* La5 may cut levels of caries-causing bacteria in the mouth, says a new study from India. Data from a doubleblind, placebo controlled trial indicated that the probiotic ice cream was associated with significant reductions in counts of *Streptococcus mutans* in children of 612 years after seven days, and these reductions were maintained until day 30 even though the ice cream was stopped after one week.

On the other hand, the effects were not maintained six months after the intervention, indicating that, *"for long term reduction of salivary* S. mutans *levels, the ingestion of probiotic organisms should be given for longer intervals",* wrote the researchers in the *Journal of Clinical & Diagnostic Research.*

Growing science, but still early…
As reported in a special edition last year by NutraIngredientsUSA, there are several different avenues for researchers to explore for probiotics to beneficially impact oral health, ranging from reducing dental plaque-related diseases, such as caries, gingivitis and periodontitis, or even reducing bad breath (halitosis). Much of the research into the oral health benefits of probiotics has focused on *S. mutans*, the main bacteria associated

with tooth decay. *S. mutans* binds to teeth via aggregation forming dental plaque. The bacteria then convert sugar to acid, which attacks the enamel of the teeth.

A recent review of 23 randomized clinical trials for probiotics and oral health in *Nutrients* (Vol. 5, pp. 25302550) concluded: *"The use of probiotic strains for caries prevention showed promising results even if only few studies have demonstrated clear clinical outcomes. "Therefore, the scientific evidence is still poor."*

Scientists from Kannur Dental College and Navodaya Dental College recruited 60 children to participate in their study. The children were divided into two groups; one fed the probiotic ice cream, and the other an identical ice cream without probiotics. *B. lactis* Bb12 and *L. acidophilus* La5 were given at a dose of one million colony forming units each.

Saliva samples taken after seven days of intervention indicated that the probiotic ice cream resulted in significant reductions in *S. mutans* counts, and such reductions were also observed after a 30 day 'washout period'. However, no significant effects were observed in the control ice cream group.

"Although the mechanism of action are unclear, various short term studies using different probiotic containing products especially dairy products including ours, concluded that there is definitive effect of probiotic organisms in reducing the salivary levels of Streptococcus mutans for short time," wrote the researchers. *"Further studies on the long term or synergetic effect of the probiotic organisms on the caries causative bacteria, oral health and optimum dosage of the probiotic organisms are still need to be explored."*
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Student investigates 400 year old herbal text for modern lessons
Food Navigator, 29Apr2015

The University of Canterbury's school of health sciences is conducting groundbreaking research into a Renaissance medico-pharmaceutical text that could hold invaluable recipes for healthy nutrition. In painstaking work, PhD student Sandra Clair is unlocking the large, 400yearold *Materia Medica*, a book of collected knowledge about medicinal plants that have influenced western herbal medicine. The sixteenth century book, which was written over 36 years at the peak of European plant-based medicine, is the most comprehensive German language encyclopaedia on plant medicine in the early modern era. It reflects a quantified approach to epidemiology and experimentally gained medical knowledge by German pharmacist, physician and botanist, Theodorus Jacobus Tabernaemontanus. 3,000 medicinal plants and their preparations "*The author systematically recorded the scholarship of physicians and local healers from antiquity to the early modern era*," said Clair. "*He describes more than 3,000 medicinal plants and their preparations, which represents a much larger therapeutic repertoire than in today's official international list of medicinal drugs*." The book's scientific approach and systematic arrangement of plant monographs, as well as its comprehensive register of herbal therapeutics and ailments in 10 languages, allows a logical way to navigate the complex information, she added.

Wisdom from the book has inspired a number of medical herbalism and modern drug developments, such as pain relieving morphine and honey wound dressings. "*I have identified a promising Renaissance recipe to treat open injuries. It contains antimicrobial and nerve regenerating ingredients and warrants further investigation. We are not exactly sure yet why the ancient potion is so effective*," said Clair.

An under-researched discipline
According to the student, plant medicine has been a neglected area of medical research, even in spite of the longevity of plant medicine since the dawn of mankind, high rates of self care by patients and the World Health Organisation's traditional medicine strategy into the effectiveness of traditional plant applications.

"*Professionally trained herbal experts are necessary for an interdisciplinary investigation of premodern medical text books so that they can be understood for their clinical relevance*," said Clair. "*My research will contribute to new insights and a platform for testing old recipes. It will highlight historic indications of selected plants over*

several centuries and further compare them with the latest biomedical research in order to validate the rational of traditional practice."
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Functional Foods 2.0: Beyond the nutritional shoehorn...
NutraIngredients, 23Apr2015

Products such as probiotic pizza, probiotic snack bars, high fibre chicken or fish oil fortified yoghurt may seem bizarre, says market expert Julian Mellentin in this guest article, but since 1990 thousands of products like this have been launched – and almost all have disappeared. But that was Functional Foods 1.0...

From the 1990s until about 2010, many companies put 'functional' before 'food'. But this period is over. Today, it's 'food first' with 'functional' in second place. In the era of Functional Foods 1.0, companies tried to shoehorn ingredients such as plant sterols, omega3s, conjugated linoleic acid (CLA), coenzyme Q10, glucosamine, GABA – to name just a few – into foods in order to market medicalised benefits, such as lowering cholesterol or supporting joint health.

With the notable exception of probiotics, 95% of the functional food NPD of this era was a failure. Who now remembers Tropicana orange juice with added omega3 fish oil or Muller omega3 yoghurt? And of those that survive, such as Elations juice for joint health, sales are at a niche level. We have also learned that securing a health claim – even from as tough a body as the European Food Safety Authority (EFSA) – might be of no commercial value if the benefit you are offering has only limited appeal.

The Fruitflow ingredient technology for example – based on a tomato extract – is backed by robust science and was the very first to secure a proprietary (article 13.5) EFSA approved claim. But the juice brand that contains it, Sirco, sells at an ultraniche level – because Sirco's medicalised benefit of better blood circulation is of interest to only a few people. And if you have a medicalised problem, chances are that you and your doctor will turn to drugs as the safe solution, not functional foods.

Avoid supplement-drug competition

In Functional Food 2.0 wise companies avoid positioning foods as a competitor with food supplements or with drugs. Instead the emphasis is on what consumers really want – which are ingredients and foods that are *"naturally functional"* and make a logical fit with foods.

As a result, since about 2005, naturally functional has become the key driver of innovation in health. This is what lies behind the massive success of almonds as an ingredient as well as coconut water (from zero to a billion euro business in the west in seven years) and growing demand for quinoa, chia, blueberries, oats and many, many others. But how can you predict which foods and ingredients will be a success? They are the ones that:

1. Have some intrinsic health benefit – or benefits – based in science (even if that science is not strong enough to secure a health claim).
2. Make a connection to some of the key trends, such as free-from, higher protein and digestive wellness.
3. Get positive media attention for their *"naturally healthy"* value.
4. Have a perception in consumers' minds of being *"natural".*

An example is chia. Its growing importance as an ingredient that is recognised by health-conscious consumers is based on rational factors, not just marketing:
1. Chia has several natural healthy properties, including: High in fibre; a good source of minerals; high in protein; a source of omega3, and gluten-free.
2. These naturally healthy properties make it appealing for journalists and bloggers compiling lists of superfoods and it is described as a *"good grain".*

In Functional Foods 2.0 companies can choose one of two directions for their strategy:
1. Products with strong medicalised benefits and health claims, usually selling on a highvalue, lowvolume niche basis in pharmacies or as medical foods.
2. Foods that have *"naturally healthy"* ingredients, often don't carry any health claim and can be found in the supermarket or health food store.

Companies choosing the first route need to adjust their sales expectations downwards and focus on the challenging task of creating effective, targeted communications.

Big growth opportunities
The second area is where the big growth opportunities lie. This is where you find entrepreneurial brands like Kind and Clif Bar, which have gone from startups to major players by delivering health and wellness in forms people really want. In Functional Foods 2.0 almost no one believes the old myth from the 1990s that a functional food is some special place *"between drugs and supplements and food".* In the mind of the consumer food is *"food first"* – unless it's a specific medical food.

As a result, any strategy that puts your functional food in direct competition with drugs or food supplements increases your risk of failure. To succeed, focus on benefits where food and beverages have a competitive advantage and where the ingredient and benefit are a logical fit to food (as with dairy and protein or fibre for digestive health), or which seem, in the consumer's mind, a *"more natural"* way of getting the benefit. The fastest growing companies are the ones that do just this.
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Thoughts drive dieting plans but feelings drive dieting behaviour, study finds

Science Daily May 5, 2015

Dieting is a process that involves a plan to change eating behaviour and behaving according to that plan. But the factors that guide diet planning differ from those that guide actual diet behaviour, according to the results of a new study.

A majority of American adults say they've tried dieting to lose weight at some point in their lives, and at any given time, about one-third of the adult population say they're currently dieting. Yet 60 percent of American adults are clinically overweight or obese and more than 16 percent of deaths nationwide are related to diet and physical activity.

"There is clearly a disconnect if we have a majority of the population that has tried to lose weight and a majority of the population that is overweight," says Marc Kiviniemi, a public health researcher at the University at Buffalo. "People are planning to diet and trying to diet, but that's not translating into a successful weight loss effort."

Many issues, from biological to environmental, determine effective weight control, but how people manage their own behaviour is a big piece of that puzzle. Dieting is a process that involves a plan to change eating behaviour and behaving according to that plan. But the factors that guide diet planning differ from those that

guide actual diet behaviour, according to the results of Kiviniemi's new study with Carolyn Brown-Kramer of the University of Nebraska-Lincoln published this month in the *Journal of Health Psychology*.

"The crux of the disconnect is the divide between thoughts and feelings. Planning is important, but feelings matter, and focusing on feelings and understanding their role can be a great benefit," says Kiviniemi, associate professor of community health and health behaviour in the UB School of Public Health and Health Professions.

Plans to change behaviour are a function of thoughts, the belief that weight loss is possible by making better food choices. But when it comes to making a food choice and decidingto execute the plan, feelings guide behaviour. "If you're sitting back conceiving a plan you may think rationally about the benefits of eating healthier foods, but when you're in the moment, making a decision, engaging in a behaviour, it's the feelings associated with that behaviour that may lead you to make different decisions from those you planned to make."

The findings highlight the shortcomings of deprivation diets or diets based on food choices that ignore people's preferences. "First of all, the deprivation experience is miserable. If you didn't associate negative feelings with it to start, you will after a few days," says Kiviniemi. "The other thing that's important is the distinction between things that require effort and things that are automatic.

"Planning is an effort that demands mental energy, but feelings happen automatically. Deprivation or anything that demands a high degree of self-control is a cognitive process. If you put yourself in a position to use that energy every time you make a food choice that energy is only going to last so long."

Kiviniemi says dieters should seriously consider enjoyment when framing and shaping a behaviour change. "In the dietary domain, eating more fruits and vegetables is fabulous advice. But if you have negative feelings about those food choices, they might not represent elements of a good plan," says Kiviniemi. "It's not just about eating healthy foods. It's about eating the healthy foods you like the most."

It's not easy, and a lot of work is required to move intention to action, which is why Kiviniemi says planning should be broadly based on both thoughts and feelings. "Think seriously about how you're going to implement the plans you make to change your behaviour, and that includes not only the feeling component, but how you plan to overcome a negative reaction that might surface during a diet." It's not just the knowledge of what we're eating, but consideration of how we'll feel having decided to eat those foods, he says.

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Is diet or exercise the best way to reduce diabetes risk?

May 6, 2015 Science Daily

Though people often think of the benefits from exercise, calorie restriction and weight loss as interchangeable, it appears that they may all offer distinct and cumulative benefits when it comes to managing type 2 diabetes risk.

In a paper recently published in *Diabetes Care*, Saint Louis University associate professor of nutrition and dietetics Edward Weiss, PhD, and colleagues found that, though people often think of the benefits from exercise, calorie restriction and weight loss as interchangeable, it appears that they may all offer distinct and cumulative benefits when it comes to managing Type 2 diabetes risk. The SLU study enrolled sedentary, overweight, middle-aged men and women who were assigned to one of three groups designed to reduce weight by 6-8 percent through calorie restriction, exercise or a combination of both.

Researchers recorded the participants' insulin sensitivity levels, a marker for diabetes risk that measures how effectively the body is able to use insulin. "Your blood sugar may be perfectly normal, but if your insulin sensitivity is low, you are on the way to blood sugar issues and, potentially, Type 2 diabetes," Weiss said.

The investigators found that both exercise and calorie restriction had positive effects on insulin sensitivity. Most interestingly, the group that did both saw two times the improvement in insulin sensitivity than either of the single-approach groups.

The study suggests that both exercise and calorie restriction have additive beneficial effects on glucoregulation (the steady maintenance of glucose, or sugar, in the body). "The exercise group was, in a way, our control group. It was already known that exercise can improve glucoregulation, both through weight loss and through mechanisms that are independent of weight loss," Weiss said. "This means that even if you don't lose weight, exercise helps. On the other hand, it often has been assumed that calorie restriction improves glucoregulation simply because it leads to weight loss."

For this reason, it was somewhat surprising to researchers when they found that exercise-induced weight loss did not lead to greater improvements in glucoregulation than calorie restriction alone. "What we found is that calorie restriction, like exercise, may be providing benefits beyond those associated with weight loss alone," Weiss said.

If this is true, researchers would expect that the combination of exercise and calorie restriction (with participants still losing between 6 and 8 percent of their weight, like the other groups) would lead to even more improved glucoregulation than either of the other groups alone. This is, in fact, what the results of the third, exercise and calorie restriction combination group confirmed.

"On the surface it may seem obvious, and yet there are a lot of people who believe that if they maintain a healthy weight, it doesn't matter what they eat," Weiss said. "And others have an appropriate food intake but don't exercise. This study says you can be healthier if you exercise and eat the right amount of food. There is more to be gained by including both approaches in your life."

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Ease of weight loss influenced by individual biology

Science Daily May 11, 2015
For the first time in a lab, researchers at the National Institutes of Health found evidence supporting the commonly held belief that people with certain physiologies lose less weight than others when limiting calories. Study results published May 11 in*Diabetes*.

Researchers at the Phoenix Epidemiology and Clinical Research Branch (PECRB), part of the NIH's National Institute of Diabetes and Digestive and Kidney Diseases, studied 12 men and women with obesity in the facility's metabolic unit. Using a whole-room indirect calorimeter -- which allows energy expenditure to be calculated based on air samples -- researchers took baseline measurements of the participants' energy expenditure in response to a day of fasting, followed by a six-week inpatient phase of 50 percent calorie reduction. After accounting for age, sex, race and baseline weight, the researchers found that the people who lost the least weight during the calorie-reduced period were those whose metabolism decreased the most during fasting. Those people have what the researchers call a "thrifty" metabolism, compared to a "spendthrift" metabolism in those who lost the most weight and whose metabolism decreased the least.

"When people who are obese decrease the amount of food they eat, metabolic responses vary greatly, with a 'thrifty' metabolism possibly contributing to less weight lost," said Susanne Votruba, Ph.D., study author and PECRB clinical investigator. "While behavioral factors such as adherence to diet affect weight loss to an extent, our study suggests we should consider a larger picture that includes individual physiology -- and that weight loss is one situation where being thrifty doesn't pay."

Researchers do not know whether the biological differences are innate or develop over time. Further research is needed to determine whether individual responses to calorie reduction can be used to prevent weight gain.

"The results corroborate the idea that some people who are obese may have to work harder to lose weight due to metabolic differences," said Martin Reinhardt, M.D., lead author and PECRB postdoctoral fellow. "But biology is not destiny. Balanced diet and regular physical activity over a long period can be very effective for weight loss."

More than one-third of American adults are obese. Complications from obesity can include heart disease, type 2 diabetes and certain types of cancer, some of the leading causes of preventable death. "What we've learned from this study may one day enable a more personalized approach to help people who are obese achieve a healthy weight," said NIDDK Director Griffin P. Rodgers, M.D. "This study represents the latest advance in NIDDK's ongoing efforts to increase understanding of obesity."

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Potential obesity treatment targets the two sides of appetite: Hunger and feeling full

Science Daily May 13, 2015
Our bodies' hormones work together to tell us when to eat and when to stop. But for many people who are obese, this system is off-balance. Now scientists have designed a hormone-like compound to suppress hunger and boost satiety, or a full feeling, at the same time. They report in ACS'*Journal of Medicinal Chemistry* that obese mice given the compound for 14 days had a tendency to eat less than the other groups.

In their study, Constance Chollet and colleagues targeted two main receptors in the body that help keep appetite in check. When hormones bind to ghrelin receptors, we feel hungry, but when others bind to Y_2 receptors, we feel full. Researchers are exploring compounds targeting the ghrelin receptor to treat obesity. But because appetite is the result of multiple hormones acting in concert, Chollet's team wanted to design a compound to better address this complexity.

The researchers designed a peptide that binds both the ghrelin and Y_2 receptors. They administered it to obese mice and found that those that received the novel peptide ate less than the other mice.

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Omega-3: Intervention for childhood behavioral problems?

Science Daily May 15, 2015
At the forefront of a field known as "neurocriminology," Adrian Raine of the University of Pennsylvania has long studied the interplay between biology and environment when it comes to antisocial and criminal behaviour. With strong physiological evidence that disruption to the emotion-regulating parts of the brain can manifest in violent outbursts, impulsive decision-making and other behavioural traits associated with crime, much of Raine's research involves looking at biological interventions that can potentially ward off these behavioural outcomes.

A new study by Raine now suggests that omega-3, a fatty acid commonly found in fish oil, may have long-term neurodevelopmental effects that ultimately reduce antisocial and aggressive behaviour problems in children. He is a Penn Integrates Knowledge Professor with appointments in the School of Arts & Sciences and the Perelman School of Medicine.

Along with Raine, the study featured Jill Portnoy a graduate student in the Department of Criminology, and Jianghong Liu, an associate professor in the Penn School of Nursing. They collaborated with Tashneem Mahoomed of Mauritius' Joint Child Health Project and Joseph Hibbeln of the National Institute on Alcohol Abuse and Alcoholism. It was published in the *Journal of Child Psychology and Psychiatry*.

When Raine was a graduate student, he, his advisor and colleagues conducted a longitudinal study of children in the small island nation of Mauritius. The researchers tracked the development of children who had participated in an enrichment program as 3-year-olds and also the development of children who had not participated. This enrichment program had additional cognitive stimulation, physical exercise and nutritional

enrichment. At 11 years, the participants showed a marked improvement in brain function as measured by EEG, as compared to the non participants. At 23, they showed a 34 percent reduction in criminal behaviour.

Raine and his colleagues were interested in teasing apart the mechanisms behind this improvement. Other studies suggested the nutritional component was worth a closer look. "We saw children who had poor nutritional status at age 3 were more antisocial and aggressive at 8, 11 and 17," Raine said. "That made us look back at the intervention and see what stood out about the nutritional component. Part of the enrichment was that the children receiving an extra two and a half portions of fish a week."

Other research at the time was beginning to show that omega-3 is critical to brain development and function. "Omega-3 regulates neurotransmitters, enhances the life of a neuron and increases dendritic branching, but our bodies do not produce it. We can only get it from the environment," Raine said.

Research on the neuroanatomy of violent criminals suggested this might be a place to intervene. Other brain-imaging researchers have shown that omega-3 supplementation increases the function of the dorsolateral prefrontal cortex, a region Raine found to have higher rates of damage or dysfunction in criminal offenders.

Raine's new study featured a randomized controlled trial where children would receive regular omega-3 supplements in the form of a juice drink. One hundred children, aged 8 to 16, would each receive a drink containing a gram of omega-3 once a day for six months, matched with 100 children who received the same drink without the supplement. The children and parents in both groups took a series of personality assessments and questionnaires at the start.

After six months, the researchers administered a simple blood test to see if the children in the experimental group had higher levels of omega-3 than those in the controls. They also had both parents and children take the personality assessments. Six months after that, the researchers had parents and children take the assessment again to see if there were any lasting effects from the supplements.

The assessments had parents rate their children on "externalizing" aggressive and antisocial behaviour, such as getting into fights or lying, as well as "internalizing" behaviour, such as depression, anxiety and withdrawal. Children were also asked to rate themselves on these traits.

While the children's self-reports remained flat for both groups, the average rate of antisocial and aggressive behaviour as described by the parents dropped in both groups by the six-month point. Critically, however, those rates returned to the baseline for the control group but remained lowered in the experimental group, at the 12-month point.

"Compared to the baseline at zero months," Raine said, "both groups show improvement in both the externalizing and internalizing behaviour problems after six months. That's the placebo effect.

"But what was particularly interesting was what was happening at 12 months. The control group returned to the baseline while the omega-3 group continued to go down. In the end, we saw a 42 percent reduction in scores on externalizing behaviour and 62 percent reduction in internalizing behaviour."

At both the six- and 12-month check-ins, parents also answered questionnaires about their own behavioural traits. Surprisingly, parents also showed an improvement in their antisocial and aggressive behaviour. This could be explained by the parents taking some of their child's supplement, or simply because of a positive response to their child's own behavioural improvement.

The researchers caution that this is still preliminary work in uncovering the role nutrition plays in the link between brain development and antisocial behaviour. The changes seen in the one-year period of the experiment may not last, and the results may not be generalizable outside the unique context of Mauritius.

Beyond these caveats, however, there is reason to further examine omega-3's role as a potential early intervention for antisocial behaviour. "As a protective factor for reducing behaviour problems in children," Liu said, "nutrition is a promising option; it is relatively inexpensive and can be easy to manage."

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How vitamin E keeps muscles healthy

Science Daily May 19, 2015
Body builders have it right: vitamin E does help build strong muscles, and scientists appear to have figured out one important way it does it. Vitamin E has long known as a powerful antioxidant, and now scientists have shown that without it, the plasma membrane, which essentially keeps a cell from spilling its contents and controls what moves in and out, cannot properly heal.

That's a big problem for many cells, such as muscle cells, which get membrane tears just from being used. "Every cell in your body has a plasma membrane, and every membrane can be torn," said Dr. Paul L. McNeil, cell biologist at the Medical College of Georgia at Georgia Regents University and corresponding author of the study in the journal *Free Radical Biology and Medicine*.

The scientist suspects knowing the cell membrane repair action of vitamin E has implications for muscular dystrophy, and common diabetes-related muscle weakness, as well as traumatic brain injury, resulting from collisions on a football field, battlefield, or roadway. With a traumatic brain injury, for example, one of the first events that happen is that the plasma membranes of the neurons, key cells in the central nervous system, tear.

"Part of how we build muscle is a more natural tearing and repair process -- that is the no pain, no gain portion -- but if that repair doesn't occur, what you get is muscle cell death. If that occurs over a long period of time, what you get is muscle-wasting disease," said McNeil.

The association between vitamin E and healthy muscles is well-established; for example, mammals and birds deprived of the vitamin experience muscle-wasting disease, in some cases lethal disease. A poor diet resulting in low vitamin E levels in the elderly contributes to frailty syndrome, a condition where muscles are weak and people are unsteady on their feet. The ubiquitous vitamin's well-established role as a powerful antioxidant has led to its use in antiaging products and in helping delay the onset of Alzheimer's by protecting neurons from free radicals.

Exactly how vitamin E protects muscle, as well as other cell types, has been unknown. "This means, for the first time, 83 years after its initial discovery, we know what the cellular function of vitamin E is, and knowing that cellular function, we can now ask whether we can apply that knowledge to medically relevant areas," McNeil said.

For the new study, rats were fed either normal rodent chow, chow where vitamin E had been removed, or vitamin E-deficient chow where the vitamin was supplemented. First, there was a period of training to ascertain the rats' innate ability to run downhill on a treadmill -- a challenging move for muscles, called an eccentric contraction. The exercise helps lengthen muscles and can produce the most soreness in athletes because of the high mechanical stress as the muscle contracts and lengthens simultaneously. Gravity is an additional force.

They found vitamin E-deficient rats were generally deficient in their running ability compared with controls and made significantly more visits to a grid, despite the fact that they received a mild electric shock when they stood there. The scientists also administered a dye that could not permeate an intact plasma membrane and found it easily penetrated the muscle cells of vitamin E-deficient rats. McNeil notes that a healthy cell makes a patch within a minute and has completely restored the cell membrane within a few minutes. Later examination of the quadriceps muscle fibres under a microscope showed rats fed normal chow or chow where vitamin E had been restored were essentially the same. The large thigh muscle fibres in rats fed vitamin E-deficient chow were smaller and inflamed.

While exactly how free radicals, or reactive oxygen species, interfere with important cell membrane repair remains a mostly unanswered question, McNeil suspects they basically get in the way. Free radicals are essentially waste products produced by normal body functions, such as using oxygen, as well as exposures to cigarette smoke and other air pollutants and chemicals. Because it's lipid-soluble, vitamin E can actually

insert itself into the membrane to prevent free radicals from attacking. It also can help keep phospholipids, a major membrane component, compliant so they can better repair after a tear. For example, exercise causes the muscle cell powerhouse, the mitochondria, to burn a lot more oxygen than normal and so produce more free radicals while the physical force tears the membrane. Vitamin E enables adequate plasma membrane repair despite the oxidant challenge, helping keep the situation in check. McNeil's finding that vitamin E is essential to rapid cell membrane repair, and ultimately cell survival, likely holds up across different cell types because, in culture at least, when the scientists have treated a number of different cells types with vitamin E, they documented similar enhanced cell membrane repair.

"The major medical significance here is yet to be uncovered," McNeil said, but could one day mean not just supplements to aid sluggish membrane repair in diseases such as muscular dystrophy, but preventive therapy for high-risk individuals such as astronauts or soldiers.

McNeil's 2011 study in *Nature Communications* indicated that, at least in cell culture, one way vitamin E keeps muscles healthy is by enabling cell membrane repair. Those studies linked the antioxidant and membrane repair benefits of vitamin E. Muscle cells in culture repaired better when vitamin E was added; when cells were exposed to free radicals, repair failed. Those findings led McNeil to see if the findings held up in research rats. Still earlier work showed that muscle cells were more fragile and membrane tears more common in muscular dystrophy. Good sources of vitamin E include vegetable oils; nuts; seeds such as sunflower seeds; green leafy vegetables; and fortified breakfast cereals, fruit juices, and margarine, according to the National Institutes of Health.

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Snacking on protein can improve appetite control, diet quality in teens

Science Daily May 21, 2015

Although eating high-protein, afternoon snacks can aid appetite control in adults, little information exists to guide parents on what types of snacks might benefit their adolescent children. Now, MU researchers have found that afternoon snacking, particularly on high-protein-soy foods, reduces afternoon appetite, delays subsequent eating and reduces unhealthy evening snacking in teenagers.

"Our research showed that eating high-protein snacks in the afternoon helps teens improve the quality of their diets as well as control appetite," said Heather Leidy, an assistant professor of nutrition and exercise physiology at MU. "Standard meals tend to go to the wayside for kids this age -- particularly from mid-afternoon to late evening -- and many of the convenient 'grab-and-go' snacks are high in fat and sugar. When kids eat high-protein snacks in the afternoon, they are less likely to eat unhealthy snacks later in the day, which is particularly important for kids who want to prevent unhealthy weight gain."

Male and female adolescents between the ages of 13 and 19 who were classified as either normal weight or overweight participated in the study, which was led by Leidy in collaboration with colleagues at DuPont Nutrition & Health. The researchers assessed how snacking in the afternoon affected teens' appetite, drive to eat and food choices later in the day and whether these were different when teens skipped eating snacks

altogether. The researchers also measured how afternoon snacking affected teens' cognitive performance and mood.

"In addition to the appetite and satiety benefits, we found that when the teens ate the high-protein snacks, they incorporated more protein throughout the day and consumed less dietary fat," Leidy said. "Thus, adding protein snacks in the afternoon could be a good strategy for individuals who are trying to eat more protein throughout the day. In addition, we also found that the high-protein snacks improved certain aspects of mood and cognitive function."

The afternoon protein snacks were soy-protein pudding. Leidy said that although high-protein puddings with soy are not available to the public, similar high-quality protein sources should elicit similar benefits.

"Health professionals increasingly are recommending that people eat more high-protein, plant-based foods like soy, which are high quality and tend to be inexpensive and environmentally friendly," Leidy said. "Our study demonstrated that the positive effects on appetite and satiety can be extended to consuming soy-protein products."

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'Do' is better than 'don't' when it comes to eating better

Science Daily May 27, 2015

Tell your child or spouse what they can eat and not what they can't. Telling your child to eat an apple so they stay healthy will work better than telling them not to eat the cookie because it will make them fat. A new Cornell discovery shows that "Don't" messages don't work for most of us.

These new findings cast a dim light on the many public health campaigns that have used a fear approach to convince us to eat better, such as telling us: don't eat candy or drink chocolate milk, or eat red meat because of harmful consequences. The Cornell study findings show that focusing on Do is better than on Don't. That is, stressing the benefits of eating healthy foods is more effective than warning against the harms of eating unhealthy foods.

The researchers analyzed 43 published international studies that involved either negative or positive nutrition messages. They found that while negative messages tended to work best with experts -- like dietitians and physicians -who were highly involved and knowledgeable in the area, most people who did not know a lot about nutrition would rather be told what they should eat and why it is good for them.

In conclusion, the researchers recommend: when designing public health messaging campaigns, focus on positive consequences of target healthy behaviours rather than focusing on the negative consequences. This way, the message is more likely to be effective among the non-expert general public instead of only appealing to health and nutrition professionals. "If you're a parent, it's better to focus on the benefits of broccoli and not the harms of hamburgers," said lead author Brian Wansink, PhD director of the Cornell Food and Brand Lab and author of Slim by Design.

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Life-prolonging protein could inhibit aging diseases

Science Daily May 28, 2015

Researchers have found a molecule that plays a key link between dietary restriction and longevity in mammals. This discovery may lead to the development of new therapies to inhibit age-related diseases. Studies have shown that moderate dietary restriction can increase the lifespan of many organisms, including mammals, while inhibiting age-related diseases such as cancer and Alzheimer's.

A team of researchers from Japan and Korea set out to understand how this happens. They discovered that a protein, called neuropeptide Y (NPY), which transmits nerve impulses in the brain and autonomic nervous system, is an essential link between dietary restriction and longevity in mice.

The researchers found that dietary restriction did not increase the lifespan of mice devoid of NPY to the same degree that it did in wild mice that had this protein. Dietary restriction also did not have the same protective effect against tumour formation and stress that it did in wild mice.

On the other hand, other adaptive processes that are activated during dietary restriction, such as changes in energy metabolism, were not affected by the absence of neuropeptide Y.

What's more, other researchers have found that an over-expression of the NPY gene increased the lifespan of rats that were not exposed to dietary restriction.

The Japan-Korea team's research, published in *Scientific Reports,* suggests that activating certain organs or tissues -- such as the liver, heart, other muscles and blood vessels -- with NPY could play a role in preventing age-related disorders, including cancer and Alzheimer's.

The researchers are currently engaged in joint exploratory research with pharmaceutical and food companies to develop substances that increase the expression of NPY as a deterrent to age-related diseases. Neuropeptide Y molecule. This neurotransmitter peptide plays an important role in food intake.

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Prevent type 2 diabetes blood-sugar spikes by eating more protein for breakfast

3 May 2015 Medical News Today
Individuals with Type 2 Diabetes have difficulty regulating their glucose -- or blood sugar -- levels, particularly after meals. Now, University of Missouri researchers have found that Type 2 diabetics can eat more protein at breakfast to help reduce glucose spikes at both breakfast and lunch.

"People often assume that their glucose response at one meal will be identical to their responses at other meals, but that really isn't the case," said Jill Kanaley, professor and associate chair in the MU Department of Nutrition and Exercise Physiology. "For instance, we know that what you eat and when you eat make a difference, and that if people skip breakfast, their glucose response at lunch will be huge. In our study, we found those who ate breakfast experienced appropriate glucose responses after lunch."

Kanaley and her colleagues monitored Type 2 diabetics' levels of glucose, insulin and several gut hormones -- which help regulate the insulin response -- after breakfast and lunch. The participants ate either high-protein or high-carbohydrate breakfasts, and the lunch included a standard amount of protein and carbohydrates.

The researchers found eating more protein at breakfast lowered individuals' post-meal glucose levels. Insulin levels were slightly elevated after the lunch meal, which demonstrated that individuals' bodies were working appropriately to regulate blood-sugar levels, Kanaley said.

"The first meal of the day is critical in maintaining glycemic control at later meals, so it really primes people for the rest of the day," Kanaley said. "Eating breakfast prompts cells to increase concentrations of insulin at

the second meal, which is good because it shows that the body is acting appropriately by trying to regulate glucose levels. However, it is important for Type 2 diabetics to understand that different foods will affect them differently, and to really understand how they respond to meals, they need to consistently track their glucose. Trigger foods may change depending on how much physical activity people have gotten that day or how long they have waited between meals."

Kanaley said that although it would be helpful for individuals with high blood sugar to eat more protein, they do not need to consume extreme amounts of protein to reap the benefits. "We suggest consuming 25 to 30 grams of protein at breakfast, which is within the range of the FDA recommendations," Kanaley said.

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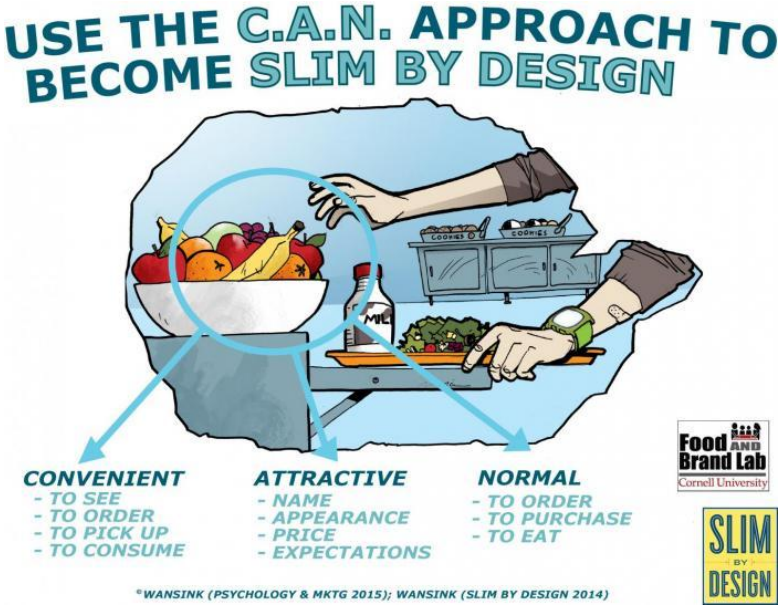
Three secrets to healthier eating

3 May 2015 Medical News Today

The CAN approach



"A healthy diet can be as easy as making the healthiest choice the most convenient, attractive, and normal." - Brian Wansink, Ph.D.

If you want to know the secrets of healthier eating, think of the kitchen fruit bowl. A fruit bowl makes fruit more convenient, attractive, and normal to eat than if the same fruit were in the bottom of the refrigerator.

A new Cornell study analyzed 112 studies that collected information about healthy eating behaviors and found that most healthy eaters did so because a restaurant, grocery store, school cafeteria, or spouse made foods like fruits and vegetables visible and easy to reach (convenient), enticingly displayed (attractive), and appear like an obvious choice (normal). "A healthy diet can be as easy as making the healthiest choice the most convenient, attractive, and normal," said Brian Wansink, Ph.D. author of Slim by Design and Director of the Cornell Food and Brand Lab.

The study, published in *Psychology and Marketing*, shows that when fruit is put in a nice bowl next to your car keys -- or when a cafeteria puts it next to a well-lit cash register -- it becomes more convenient, attractive, and normal to grab a banana than the chocolate chip cookie dough ice cream in the far back of the freezer. When restaurants give the high-profit shrimp salad appetizer an enticing name, highlight it on the menu, and have

the waitress point it out as a special, it becomes more convenient, attractive, and normal to order that than the deep-fried onion rings on the back of the menu.

"With these three principles, there are endless changes that can be made to lead people -- including ourselves -- to eat healthier," said Wansink. For instance, if a school wants children to drink more white milk than chocolate milk, they can make white milk more convenient (put it in the front of the cooler), more attractive (sell it in a shapely bottle), or more normal (give it half of the cooler space instead of a small corner of the cooler). In previous studies conducted by Dr. Wansink each of these changes increased white milk consumption by 30-60% in schools.

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Vitamin D toxicity rare in people who take supplements, Mayo Clinic researchers report

4 May 2015 Medical News Today
Over the last decade, numerous studies have shown that many Americans have low vitamin D levels and as a result, vitamin D supplement use has climbed in recent years. Vitamin D has been shown to boost bone health and it may play a role in preventing diabetes, cancer, cardiovascular disease and other illnesses. In light of the increased use of vitamin D supplements, Mayo Clinic researchers set out to learn more about the health of those with high vitamin D levels. They found that toxic levels are actually rare.

A vitamin D level greater than 50 nanograms per milliliter is considered high. Vitamin D levels are determined by a blood test called a serum 25-hydroxyvitamin D blood test. A normal level is 20-50 ng/mL, and deficiency is considered anything less than 20 ng/mL, according to the Institute of Medicine (IOM).

The researchers analyzed data collected between 2002 and 2011 from patients in the Rochester Epidemiology Project, a National Institutes of Health-funded medical records pool that makes Olmsted County, Minn., the home of Mayo Clinic, one of the few places worldwide where scientists can study virtually an entire geographic population to identify health trends.

Of 20,308 measurements, 8 percent of the people who had their vitamin D measured had levels greater than 50 ng/mL, and less than 1 percent had levels over 100 ng/mL.

"We found that even in those with high levels of vitamin D over 50 ng/mL, there was not an increased risk of hypercalcemia, or elevated serum calcium, with increasing levels of vitamin D," says study co-author Thomas D. Thacher, M.D., a family medicine expert at Mayo Clinic.
Hypercalcemia, or high blood calcium, can occur when there are very high levels of vitamin D in the blood. Too much calcium in the blood can cause weakness, lead to kidney stones, and interfere with the heart and brain, and even be life threatening.

The Mayo researchers also found that women over age 65 were at the highest risk of having vitamin D levels above 50 ng/mL. The result was not surprising because that's a group that often takes vitamin D supplements, Dr. Thacher says.

Another notable outcome: The occurrence of high vitamin D levels over 50 ng/mL increased during the 10-year period of the study, from nine per 100,000 people at the start of the study up to 233 per 100,000 by the end.

"We were surprised by that degree of dramatic increase in vitamin D levels," Dr. Thacher says.

Only one case over the 10-year study period was identified as true acute vitamin D toxicity; the person's vitamin D level was 364 ng/mL. The individual had been taking 50,000 international units (IU) of vitamin D supplements every day for more than three months, as well as calcium supplements. The IOM-recommended upper limit of vitamin D supplementation for people with low or deficient levels is 4,000 IU a day.

It's important for doctors to ask their patients about the doses of vitamin D supplements that they are using, Dr. Thacher says, because even capsules containing as much as 50,000 IU of vitamin D are available without prescription. If taken on a daily basis, that amount could lead to toxicity.

Some natural sources of vitamin D include oily fish such as mackerel and salmon, fortified milk, and sunlight.

"Our bodies will naturally produce vitamin D when our skin is exposed to sunlight, however, we don't recommend excessive exposure to sun due to the risk of skin cancer," Dr. Thacher added.
In an accompanying editorial in *Mayo Clinic Proceedings*, Dr. Michael F. Hollick, Ph.D., M.D., describes vitamin D's dramatic medical history, the need for judicious dosing, but the importance of vitamin D supplementation in those with low or deficient levels.
"The evidence is clear that vitamin D toxicity is one of the rarest medical conditions and is typically due to intentional or inadvertent intake of extremely high doses," writes Hollick, a professor of medicine, physiology and biophysics at Boston University School of Medicine.
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Healthy diets make brighter brains

7 May 2015 Medical News Today

A study following nearly 28,000 people aged 55 and older at high cardiovascular risk, which monitored their diets for 5 years and tested declines against thinking and memory tests, found a smaller drop in brain power for those who ate well.

Fish was part of healthy eating while red meat was among the unhealthy foods.

The American Academy of Neurology has published the results in the journal *Neurology*. The healthy eating linked to the stronger cognitive health was a diet with not much red meat, moderate alcohol and lots of fruits and vegetable, nuts and fish.

The 27,860 over-55s included for the analysis, from across 40 countries, were studied over an average of around 5 years.

Certain health conditions were excluded at the start of the study of people at high risk of cardiovascular disease. None of the participants had diabetes or a history of heart disease, stroke or peripheral artery disease; nor had any recently experienced serious disease outcomes such as a stroke or congestive heart failure.

Participants who experienced heart disease or stroke during the study were no longer followed for diet and mental power.

To take a baseline measure of cognitive health and monitor any decline, thinking and memory skills were tested at the start of the study, then 2 years and about 5 years later.

A maximum of 30 points was possible against these thinking and memory tests and cognitive decline was noted when scores dropped by 3 points or more, which happened for 17% overall - a total of 4,699 participants.

Cognitive decline lowest among those who reported healthiest diets

The proportion registering a decline was lower for people reporting the healthiest diets - 14% of these showed a drop in thinking and memory, compared with 18% of the people eating the least healthy diets.

Measuring cognitive health

This new study linking brain power and diet involved a test of cognitive health that is used during dementia diagnosis. The mini mental state examination (MMSE) measures:

- Orientation to time and place
- Word recall
- Language abilities
- Attention and calculation
- Visuospatial skills.

More about cognitive tests in dementia

For the measure of diet, the participants were asked at the start of the study to say how often they ate certain foods, including vegetables, nuts and soy proteins, whole grains and deep-fried foods. They also reported levels of alcohol intake and gave data to produce a ratio of fish to meat and eggs in their diets.

The measure of diet quality was a modified version of the healthy eating index used by the US government. Among the 5,687 people with the healthiest diet, 782 made up the 13.8% having cognitive decline, while of the 5,459 people with the least healthy diets, 987 accounted for the 18.1%. The relative difference from these figures produces a 24% lower likelihood of a drop in thinking and memory for people eating well. The researchers accounted for factors that could have affected the results, such as physical activity, high blood pressure and history of cancer.

Study author Dr. Andrew Smyth, of McMaster University in Hamilton, Ontario, Canada, and the National University of Ireland in Galway, says diet in later life is only part of the picture: "Adoption of a healthy diet probably begins early in life, and a healthy diet might also go along with adoption of other healthy behaviours." For their data, the authors examined participants from randomized drug trials in cardiovascular disease supported by pharmaceutical company Boehringer Ingelheim.

In background to their work, the authors cite previous brain health links to healthy diet but point out that using the large multinational prospective cohort study allows observation of "more precise associations between diet (assessed using standardized methodology) and cognitive outcomes."

Explaining what biological explanations may lie behind the emerging evidence, the authors say: "Dietary intake may modify the risk of cognitive decline through multiple mechanisms, including increased risk of stroke (both overt and covert) and through deficiency of nutrients required for neuronal regeneration (for example, group B vitamins, and vitamin C)."

The risk factors for dementia listed by the US National Institute of Neurological Disorders and Stroke includes a number that can be modified by dietary and lifestyle measures.

The new study ends by stating: "In conclusion, we report that higher diet quality is associated with a reduced risk of cognitive decline. Improved diet quality represents an important potential target for reducing the global burden of cognitive decline."

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Omega-3 fatty acids enhance cognitive flexibility in at-risk older adults

20 May 2015 Medical News Today
A study of older adults at risk of late-onset Alzheimer's disease found that those who consumed more omega-3 fatty acids did better than their peers on tests of cognitive flexibility -- the ability to efficiently switch between tasks -- and had a bigger anterior cingulate cortex, a brain region known to contribute to cognitive flexibility.

The analysis suggests, but does not prove, that consuming DHA and EPA, two omega-3 fatty acids found in fish, enhanced cognitive flexibility in these adults in part by beefing up the anterior cingulate cortex, the researchers report in the journal *Frontiers in Aging Neuroscience.*

"Recent research suggests that there is a critical link between nutritional deficiencies and the incidence of both cognitive impairment and degenerative neurological disorders, such as Alzheimer's disease," said University of Illinois neuroscience, psychology, and speech and hearing science professor Aron Barbey, who led the study with M.D./Ph.D. student Marta Zamroziewicz. "Our findings add to the evidence that optimal nutrition helps preserve cognitive function, slow the progression of aging and reduce the incidence of debilitating diseases in healthy aging populations."

The researchers focused on aspects of brain function that are sometimes overlooked in research on aging, Zamroziewicz said. "A lot of work in cognitive aging focuses on memory, but in fact cognitive flexibility and other executive functions have been shown to better predict daily functioning than memory does," she said.

"Executive function" describes processes like planning, reasoning, paying attention, problem solving, impulse control and task switching. "These functions tend to decline earlier than other cognitive functions in aging," Zamroziewicz said. The new research built on previous studies that found associations between omega-3 fatty acid consumption, cognitive flexibility and the size of the anterior cingulate cortex.

"There's been some work to show that omega-3 fatty acids benefit cognitive flexibility, and there's also been work showing that cognitive flexibility is linked to this specific brain region, the anterior cingulate. But there's been very little work actually connecting these pieces," Zamroziewicz said.

The new study focused on 40 cognitively healthy older adults between the ages of 65 and 75 who are carriers of a gene variant (APOE e4) that is known to contribute to the risk of developing late-onset Alzheimer's disease.

The researchers tested participants' cognitive flexibility, measured levels of the fatty acids EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) in their blood, and imaged their brains using MRI. Statistical analyses teased out the relationships between these factors.

"We wanted to confirm that higher omega-3 fatty acids related to better cognitive flexibility, and we did in fact see that," Zamroziewicz said. "We also wanted to confirm that higher omega-3 fatty acids related to higher volume in the anterior cingulate cortex, and we saw that. Finally, we were able to show that higher volume in the anterior cingulate cortex was an intermediary in the relationship between omega-3 fatty acids and cognitive flexibility."

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Food choices influenced by memory

23 May 2015 Medical News Today

You have a choice between two foods: a chocolate bar or a piece of cake. What influences your decision? The desire to be healthy? The need for a sugar boost? According to a new study, your choice may be influenced by your memory of a particular food. A stronger memory association with an apple, for example, may encourage you to opt for the apple, even if the cake is the more attractive choice.

Apple or cake? We are more likely to choose the food we have a stronger memory of, according to the study.

The study also reveals that the influence of memories in food choice is driven by an increase in communication between two brain regions - the hippocampus and the ventromedial prefrontal cortex. Study leader Dr. Sebastian Gluth and colleagues, from the University of Basel in Switzerland, publish their findings in the journal *Neuron*.

According to the researchers, many everyday decisions we make - such as "Where shall we go for dinner?" - are guided by information retrieved from our memories. However, the neurological processes underlying such decisions were unclear. Dr. Gluth and colleagues set out to gain a better understanding of these processes.

The team enrolled 60 young participants to their study and showed them 48 snacks - including chocolate bars, pretzels and chips - on a computer screen. Each snack was allocated to a specific location on the screen, and the participants were asked to rate each snack in order of preference.

Next, the participants underwent functional magnetic resonance imaging (fMRI), during which they were repeatedly asked to choose between two snacks. However, 30 participants were only shown the location of the snack, meaning they had to recall the snack linked to each location. The other 30 participants were shown the snacks directly on the screen.

Participants were more likely to choose snacks they could remember

From their experiment, the researchers found that participants opted for the snacks they were better able to recall the location of. What is more, subjects chose they snacks they could recall better even if they had rated them lower in preference previously.

The food choices of the 30 participants who were shown the snacks directly on the screen during fMRI correlated with their previous preference ratings. From the fMRI scans, the team was able to assess the brain activity of participants during their memory-based food choices. This enabled them to create a mathematical model showing how memories influence the decision-making process.

From this, they identified an increase in communication between the hippocampus - the brain region involved in memory - and the ventromedial prefrontal cortex - the decision-making brain region - as participants made their food choices.

Commenting on the relevance of these findings, Dr. Gluth says: "Our study builds a bridge between two central research fields of psychology, that is, memory and decision-making research."

The team adds that the fMRI scans and mathematical modeling also provide an accurate understanding of how the hippocampus and the ventromedial prefrontal cortex interact with each other during decision-making. In 2013, *Medical News Today* reported on a study published in the *Journal of the Academy of Nutrition and Dietetics*, in which researchers found that what other people around us eat may influence our own food choices.

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Study adds to evidence that increasing dietary fiber reduces the risk of developing diabetes

27 May 2015 Medical News Today
New research published in *Diabetologia* (the journal of the European Association for the Study of Diabetes) indicates that consuming greater quantities of dietary fibre reduces the risk of developing type 2 diabetes.

Over 360 million people worldwide are estimated to be affected by diabetes, and this number is projected to increase to more than 550 million by 2030, with serious consequences for the health and economy of both developed and developing countries. While previous research has found an association between increased dietary fibre intake and a reduced risk of developing type 2 diabetes, most of these data come from the United States, and amounts and sources of fibre intake differ substantially between countries. In this article the authors evaluated the associations between total fibre as well as fibre from cereal, fruit, and vegetable sources, and new-onset type 2 diabetes in a large European cohort across eight countries, in the EPIC-InterAct Study. They also conducted a meta-analysis where they combined the data from this study with those from 18 other independent studies from across the globe.

Dagfinn Aune, a PhD student affiliated with the Norwegian University of Science and Technology and Imperial College London, analysed data from EPIC-InterAct together with colleagues. The EPIC-InterAct study is the world's largest study of new-onset type 2 diabetes, and is coordinated by the MRC Epidemiology Unit at Cambridge University. EPIC-InterAct includes 12,403 verified incident cases of type 2 diabetes, and, for comparison, a sub-cohort of 16,835 individuals deemed representative of the total cohort of the European Prospective Investigation into Cancer and Nutrition (EPIC) study including some 350,000 participants.

The authors divided the study participants into four equally sized groups from lowest to highest fibre intake, and assessed their risk of developing type 2 diabetes over an average of 11 years' follow-up.

They found that participants with the highest total fibre intake (more than 26 g/day) had an 18% lower risk of developing diabetes compared to those with the lowest total fibre intake (less than 19g/day), after adjusting for the effect of other lifestyle and dietary factors. When the results were adjusted for body mass index (BMI) as a marker of obesity, higher total fibre intake was found to be no longer associated with a lower risk of developing diabetes, suggesting that the beneficial association with fibre intake may be mediated at least in part by BMI. In other words, dietary fibre may help people maintain a healthy weight, which in turn reduces the chances of developing type 2 diabetes.

When the authors evaluated the different fibre sources, they found that cereal fibre had the strongest inverse association: those with the highest levels of cereal and vegetable fibre consumption had a 19% and 16% lower risk of developing diabetes respectively, compared with those with the lowest consumption of these types of fibre. Again, these associations disappeared when the results were adjusted for BMI. By contrast, fruit fibre was not associated with a reduction in diabetes risk. Cereals accounted for 38% of the total fibre intake, and were the main source of fibre in all the countries involved in the study (with the exception of France where vegetables were the main source).

The authors also undertook a meta-analysis, where they pooled the data from this EPIC-InterAct study with those from 18 other independent studies (eight in the United States, four in Europe, three in Australia, and three in Asia). The meta-analysis included over 41,000 new-onset cases of type 2 diabetes and found that the risk of diabetes fell by 9% for each 10g/day increase in total fibre intake, and by 25% for each 10g/day increase in cereal fibre intake. They did not find a statistically significant relationship between increasing either fruit or vegetable fibre and reducing diabetes risk.

Dagfinn Aune said: "Taken together, our results indicate that individuals with diets rich in fibre, in particular cereal fibre, may be at lower risk of type 2 diabetes. We are not certain why this might be, but potential mechanisms could include feeling physically full for longer, prolonged release of hormonal signals, slowed down nutrient absorption, or altered fermentation in the large intestine. All these mechanisms could lead to a lower BMI and reduced risk of developing type 2 diabetes. As well as helping keep weight down, dietary fibre may also affect diabetes risk by other mechanisms -- for instance improving control of blood sugar and decreasing insulin peaks after meals, and increasing the body's sensitivity to insulin."

Professor Nick Wareham, senior author on the paper and Director of the MRC Epidemiology Unit, University of Cambridge, added: "This work adds to the growing evidence of the health benefits of diets rich in fibre, in

particular cereal fibre. Public health measures globally to increase fibre consumption are therefore likely to play an important part in halting the epidemics of obesity and of type 2 diabetes."

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Component in green tea may help reduce prostate cancer in men at high risk, Moffitt Cancer Center researchers say

Medical News Today 28 May 2015

Prostate cancer is the second most common type of cancer in men and is predicted to result in an estimated 220,00 cases in the United States in 2015. In recent years, an emphasis has been placed on chemoprevention - the use of agents to prevent the development or progression of prostate cancer. A team of researchers led by Nagi B. Kumar, Ph.D., R.D., F.A.D.A. at Moffitt Cancer Centre recently published results of a randomized trial that assessed the safety and effectiveness of the active components in green tea to prevent prostate cancer development in men who have premalignant lesions. The results will be presented at the 2015 American Society of Clinical Oncology (ASCO) Annual Meeting in Chicago.

Twenty percent of green tea is consumed in Asian countries where prostate cancer death rates are among the lowest in the world and the risk of prostate cancer appears to be increased among Asian men who abandon their original dietary habits upon migrating to the U.S.

Laboratory studies have shown that substances in green tea called, "catechins" inhibit cancer cell growth, motility and invasion, and stimulate cancer cell death. Green tea catechins also prevent and reduce tumor growth in animal models. Epigallocatechin-3-gallate (EGCG) is the most abundant and potent catechin found in green tea responsible for these cancer prevention effects.

The goal of this trial was to evaluate if a one-year intervention with green tea catechins could suppress prostate cancer development in men who had high-grade intraepithelial neoplasia (HGPIN) or atypical small acinar proliferation (ASAP). The researchers used decaffeinated green tea capsules called Polyphenon E that contained a mixture of catechins that predominantly contained EGCG at a dose of 200 mgs twice a day.

The researchers compared Polyphenon E in 49 men to placebo tablets in 48 men over a 1 year treatment period. Overall, the difference in the number of prostate cancer cases at the end of 1 year between the two treatment groups was not statistically significant. However, in men who only had HGPIN at the beginning of the trial, they observed a lower combined rate of ASAP and prostate cancer development with Polyophenon E. ASAP is an entity that reflects a broad group of lesions in the prostate with insufficient changes in the cells to be definitively diagnosed as prostate cancer. Additionally, men on Polyphenon E had a significant decrease in prostate-specific antigen (PSA) levels. PSA is a biomarker that in combination with other risk factors is used to screen patients for prostate cancer, and high levels signify a higher risk of prostate cancer.

The Moffitt researchers observed a significant increase in the levels of EGCG in the blood plasma of men on Polyphenon E, and the capsules at this dose were tolerated in this group of men.

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Step aside energy drinks: Chocolate has a stimulating effect on human brains, says Hershey-backed study
Confectionery News, 18May2015

Researchers from the Northern Arizona University (NAU) and Arizona Western College (AWC) concluded that dark chocolate confections containing only moderate amounts (60%) of cacao have an acute stimulating effect on the human brain and vasoconstrictive effects on peripheral vasculature. The study published in the journal NeruoRegulation by Michelle Montopoli and others was conducted with support from The Hershey Company that provided chocolate products for the study and reviewed the manuscript prior to submission.

"*Chocolate is indeed a stimulant and it activates the brain in a really special way*," said Stevens, a professor of psychological sciences at NAU. "*It can increase brain characteristics of attention, and it also significantly affects blood pressure levels*," he said in a NAU release announcing the results of the study. The study is the first to examine the acute effects of chocolate on attentional characteristics of the brain and the first ever study of chocolate consumption performed using electroencephalography, or EEG technology. EEG studies take images of the brain while it is performing a cognitive task and measure the brain activity.

Higher alertness

The researchers enlisted 122 participants between the ages of 18 and 25 to consume three chocolate treatments: higher (60%) cacao chocolate, low (0%) cacao chocolate or higher cacao chocolate + Ltheanine. In their study, researchers also included Ltheanine, an amino acid extracted from green tea, because it has been shown in numerous animal and human studies to counteract the stimulating effects of caffeine and stressors. All the treatments were prepared by The Hershey Company and individually wrapped in 40 g squares of identical appearance and coded by content.

The results for the participants who consumed the 60% cacao chocolate showed that the brain was more alert and attentive after consumption. Their blood pressure also increased for a short time. "*A lot of us in the afternoon get a little fuzzy and can't pay attention, particularly students, so we could have a higher cacao content chocolate bar and it would increase attention*," Stevens said. He added that a regular chocolate bar with high sugar and milk content won't be as good, it's the high cacao content chocolate that can be found from most manufacturers that will have these effects.

Ltheanine counteracts blood pressure spike

The most interesting results came from one of the control conditions, the 60% percent cacao chocolate which included Ltheanine. This combination hasn't been introduced to the market yet, but it is of interest to Hershey and the researchers. "*Ltheanine is a really fascinating product that lowers blood pressure and produces what we call alpha waves in the brain that are very calm and peaceful*," Stevens said. "*We thought that if chocolate acutely elevates blood pressure, and Ltheanine lowers blood pressure, then maybe the Ltheanine would counteract the short term hypertensive effects of chocolate*."

For participants who consumed the high cacao content chocolate with Ltheanine, researchers recorded an immediate drop in blood pressure. "*It's remarkable. The potential here is for a heart healthy chocolate confection that contains a high level of cacao with Ltheanine that is good for your heart, lowers blood pressure and helps you pay attention*," Stevens said.

Additional research warranted

For reasons of palatability and availability, the study utilized a dark chocolate confection containing only moderate amounts (60%) of cacao. The researchers admitted that this choice of chocolate confections was a "major limitation of this study" and quite likely resulted in the small effect sizes found in the analyses, even though the results reported were statistically significant.

Stevens said he hopes the results of this study will encourage manufacturers to investigate further and consider the health benefits of developing a chocolate bar made with high cacao content and Ltheanine. "*There are quite palatable chocolate preparations publicly available containing up to 90% cacao. Certainly this study should be replicated with a palatable chocolate confection containing higher percentages of cacao or increased concentrations of cacao bioactives to increase the magnitude of effect and to better understand which cacao constituents are predominantly responsible for these effects*," the authors concluded.

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Omega3s may boost performance for cyclists: Study
06May2015 NutraIngredients USA

Supplements containing omega3s may increase concentrations of NO and boost blood flow, thereby enhancing exercise performance in cyclists, says a new study from Poland. Scientists from the Academy of Physical Education in Katowice and the Medical University of Silesia report that omega3 supplementation boosted baseline NO concentrations by an average of 8 micromoles per liter more than placebo, and boosted flow mediated dilation (FMD – a measure of blood flow and vascular health) by 5.25%, compared with placebo.

These increases in FMD were associated with significant increases in VO2max (maximal oxygen uptake), compared with placebo, according to findings published in the *European Journal of Sport Science.* The study adds to a small but growing body of science supporting the sports nutrition potential of omega3s. Last year, Japanese scientists from Nippon Suisan Kaisha, Ltd, The University of Tokyo, the University of Toyama, and Josai International University reported that daily supplements of an EPArich fish oil may boost exercise economy, a predictor of endurance exercise performance.

In that instance, a daily fish oil dose of 3.6 grams for eight weeks was associated with increases in EPA and DHA levels in red blood cells (erythrocytes) and decreases in oxygen uptake (VO2) during steady state Sub-maximal exercise (*Bioscience, Biotechnology, and Biochemistry)*.

The new study involved 13 elite cyclists and randomly assigned them to receive daily omega3 supplements (1.3 grams per day) or placebo for three weeks. Results showed significant differences between baseline NO levels pre and post-supplementation, with levels increasing from an average of 13.9 to 23.5 micromoles per litre, whereas NO levels post-placebo intervention only increased to 15.3 micromoles per litre.

"These findings suggest that an increase in NO release in response to n3 PUFA supplementation may play a central role in cardiovascular adaptive mechanisms and enhanced exercise performance in cyclists," concluded the researchers.
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Single multi-vitamin mineral dose may boost mood in older people
NutraIngredients USA, 12May2015

A single dose of a multivitamin and mineral and herbal supplement may reduce stress in healthy older women, says a new study from Australia. Data from a 76 women revealed that a single dose of the commercial product Swisse Women's Ultivite 50+ containing vitamins, mineral, antioxidants, and plant extracts was associated with overall mood ratings on the depression anxiety stress scale (DASS), scientists from Swinburne University and Deakin University report in the journal *Age.*

The most significant effects were observed for perceived mental stress, said the researchers, led by Dr Helen

Macpherson. On the other hand, no benefits for cognition were observed for the women after a single dose. The study extends earlier work from the same researchers, which did find cognitive benefits for performance accuracy and enhance neural efficiency in older women after 16 weeks of supplementation with the same Ultivite 50+ product.

Similar results were observed for older men, with eight weeks of daily supplementation with a multivitamin and mineral supplement with added herbal ingredients linked to improvements in episodic memory, according to a 2012 paper published in *Human Psychopharmacology: Clinical and Experimental.*

"A number of randomized controlled trials have indicated that multivitamin/mineral supplementation for a period of 4 weeks or greater can enhance mood and cognition," wrote Dr Macpherson and her coworkers. *"To date, no studies have investigated whether a single multivitamin dose can benefit mental function in older adults."*

To fill the scientific gap, Dr Macpherson and her coworkers recruited health women aged between 50 and 75 to participate in their randomized controlled trial. The women were randomly assigned to receive a single multivitamin and mineral and herbal (MVMH) supplement or placebo. Women were then asked to self-rate their mood and perform a battery of computerized cognitive tests.

Results showed that, while the single dose had no effect on cognitive results, the MVMH supplement was associated with improvements in overall DASS mood ratings. *"These findings were confirmed using visual analogue scales, with these measures also demonstrating MVMH-related increased ratings of calmness,"* added the researchers.

The potential mood benefits of chronic multivitamin supplementation have previously been linked to the B vitamin content of the products, and folate, B6 and B12 in particular, because these nutrients have important roles in neurotransmitter synthesis.

On the other hand, poorer mood has been linked to low levels of vitamin D, zinc and selenium. Commenting on the potential mechanism, Dr Macpherson and her coauthors said that this is unexplored, but that others have proposed that *"improved vascular endothelial function and improvements in mitochondrial function serve as a potential mechanism for acute cognitive improvements. For instance, improved vasodilation and blood flow to the brain results in the increased delivery of metabolites to active tissue, leading to improved task performance. "Without the measurement of blood metabolites in this study, potential mechanisms can only be speculated."*

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Food Science & Industry News

Global flavours market to reach $15.2 billion by 2020
A new report by Allied Market Research forecasts the global flavours market to reach $15.2 billion by 2020 at a compound annual growth rate (CAGR) of 4.3% from 2015 to 2020. In 2014, the natural flavours segment took over the lead to hold the majority of share in terms of value, with a strong demand for organic processed food and beverages driving growth in this segment. The growth outlook for natural flavours remains strong while synthetic flavours may witness negative growth.

Demand for organic and healthy food products, changing consumer preferences, introduction of new and enhanced flavours, and demand growth of processed food products have been instrumental in the growth of flavours market. On the other hand, the flavours industry faces challenges in the form of stringent food safety regulations and a few adverse effects on human health. However, the natural flavours segment has been adept at addressing such concerns.

North America currently is the largest consumer of natural flavours; however, by 2020, Asia Pacific is predicted to catch up and marginally lead the natural flavours market segment. Nevertheless, North America and Europe will continue to hold more than half of the revenue share for natural flavours segment through 2020. Despite overall negative growth in synthetic flavours market, the outlook will remain slightly positive in Latin America, the Middle East, and Africa. Asia Pacific will remain the largest market for synthetic flavours through 2020.

In terms of revenue, the beverage segment tops the list, followed by bakery, confectionery, savoury, and snacks. In contrast, the growth for flavours in the dairy and frozen food segments is expected to be the highest for the forecast period due to the high demand of meat products in Asia Pacific and Latin America. The animal/pet food segment will also gain momentum with emerging economies being at the forefront of the growth. The overall animal/pet food flavours market segment will grow at a CAGR of 4.4% during 2015–2020.

The flavours (food and beverages) industry is largely consolidated with the top five players holding about 65% revenue share in 2014. Givaudan SA leads the global market followed by Kerry Group and Firmenich. Other key players such as Symrise AG, Sensient Technologies, Frutarom Industries, T. Hasegawa Co., International Flavours & Fragrance (IFF), Wild Flavours, Takasago International, and Huabao International have been able to maintain their market positions through innovation and market development strategies.

IFT Weekly May 13, 2015

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5 strategies to maximize snack sales
28Apr2015 Food Navigator - USA

Sales of snacks are poised for significant growth in the U.S. in the next five years, but for the category to reach its full potential, manufacturers need to go beyond new product launches to fully exploit all opportunities for growth, according to a sales and marketing analyst.

"The future looks very bright for snacking" with category sales estimated to *"hit at least, if not more than $200 billion by 2020,"* said Sally Lyons Wyatt, executive VP and practice leader, client insights at IRI. The category is well positioned for success with sales already outpacing those of overall food and beverage retail, she added, during a March webinar hosted by IRI on the state of the snack industry. Specifically, she noted, dollar sales of

snacks grew 2.9% last year and unit sales rose 0.7% compared to 2.7% sales and 0.6% unit increase in all food and beverage.

Much of the growth came from more consumers embracing snacks, Wyatt said. She added 41% of consumers ate three or more snacks per day in 2014 and that consumers who said they were snacking more frequently increased 11 percentage points from 2011. In addition, the percentage of consumers who said they were treating themselves to indulgent snacks as treats climbed 8 points in 2014 from 2011.

Innovation also helped drive snack sales, Wyatt said. Many new products involved strong flavors, such as bacon, organic ingredients, popcorn, trail mix, protein, simple ingredient lists, whole grains and low sugar, she said. Snack makers will need to do more going forward, however, in order to reach $200 billion in sales by 2020, Wyatt said. She suggested companies pursue the following five strategies to maximize snack sales:

Strategy #1: Size channel strategies – Where consumers buy snacks is changing and manufacturers need to align their assortment and distribution strategies against consumers' evolving preferences and shopping habits to ensure they have the right product at the right place at the right time, Wyatt said. For example, she said, value oriented channels are growing faster than traditional channels overall with dollar stores growing 10% annually at a compound rate compared to only 1.9% CAGR at traditional food outlets, 3.4% CAGR at mass stores and 2.5% at drug stores.

Snack penetration also is increasing at club, dollar and ecommerce stores, while it is falling at food, drug and mass, she said. *"Consumers have gotten smarter in how they shop in different channels and really comes down to what they need in the moment,"* and whether then value price or convenience more, she said. In response, retailers are varying their product mix and pack size, and manufacturers should as well, she said.

Strategy #2: Find growth organically and naturally – More households are buying natural snacks, with much of the growth coming from non-GMO claims, Wyatt said. According to IRI data, 75.1% of households in the U.S. bought natural snacks – up 0.9 points in 2014 from 2013. Penetration of non-GMO snacks also climbed 4.6 points to 41.2% of households in 2014, but penetration of organic snacks fell 0.4 points to 32% of households in the same time.
Beyond non-GMO, claims that are driving growth in the natural segment include call outs of whole grains and premium ingredients, Wyatt said.

Strategy #3: Contemporize brand engagement – What type of snacks consumers buy often hinges on their age and lifestyle preferences, and manufacturers should target these groups accordingly, Wyatt said. For example, millennials and boomers snack throughout the day, but boomers get a later start and taper off earlier than millennials so it makes sense to target them with midday options rather than early morning snacks, Wyatt said.

What people eat also varies by the time of day, Wyatt said. Bakery snacks are consumed by 81% of people, but most age groups prefer them in the afternoon and evening and not at lunch or for special occasions.

Strategy #4: Tailor snacks to different need states – Iconic brands can get a face lift by demonstrating how consumers can customize them for their needs, Wyatt said. She pointed out a marketing campaign for Triscuit that showed how consumers could make the crackers their own by creatively topping them with whatever they wanted. Likewise, positioning snacks to meet disease states or to be allergy-free shows consumers that a product is tailored to them, Wyatt said. She added that sales of allergy free snacks are up 33.5% in 2014 from the prior year.

Strategy #5: Watch upcoming trends – *"Keeping a watchful eye on upcoming trends is important to continued – growth in the industry,"* Wyatt said. Trends she see emerging in the snack category include premiumtizing ingredients by swapping out conventional ingredients with organic alternatives, vegan and fair trade claims and snacks made with raw chocolate and sprouted grains.
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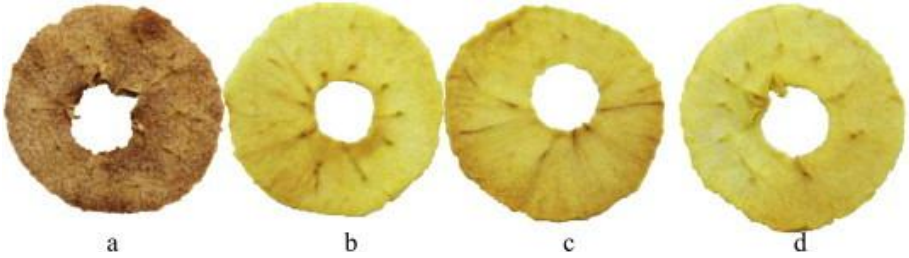
Isomalt protects vitamin C status of baked apple snacks, finds study
15Apr2015 Food Navigator - USA

Isomalt can be used to protect the ascorbic acid content of apple snacks during baking, say researchers. Published in *LWT Food Science and Technology*, researchers from Argentina assessed physical, chemical and sensory properties of baked apple snacks made using the sugar substitute isomalt and polysaccharide maltodextrin. Findings showed isomalt protected the snack during baking.

"Its use had a protective effect on the apple tissue submitted to high temperatures since the snack had good quality attributes and also preserved the added ascorbic acid during the baking process," the researchers wrote. This meant the apple snacks could be baked at higher temperatures (140°C) for shorter times, they added.



Apple ring (a) was the control which browned quickly during baking

Calcium, isomalt and maltodextrin pretreatment Granny Smith apples were used in the study – pretreated with calcium lactate for two minutes before being chilled over ice and pretreated with aqueous solutions of Isomalt (I) and maltodextrin (M) for 15 minutes.
"After the pretreatments with I:M, moisture decreased on average four times (dry base)," the researchers said. Ascorbic acid content retention after baking was also significantly higher when pretreated with I:M – about 50% on average, which was valuable from a health perspective, they said.

"The Recommended Dietary Allowance (RDA) of vitamin C covers an expanded range of values, from 40 mg/day to 3 g/day. Hence, a serving of 20 g of the snacks formulated with isomalt would nearly cover a demanding daily requirement of vitamin C."

They also found a 2:1 isomalt maltodextrin ratio maintained a constant ascorbic acid content during 120 days storage. *"This is an innovative food product since isomalt has hardly been used to formulate snacks,"* they wrote.
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Chinese breast milk discovery strengthens case for probiotics in infant formula
NutraIngredients, 11May2015


Chr Hansen has confirmed the presence of bifidobacteria and lactobacilli in breast milk from Chinese mothers a discovery it claims strengthens the case for adding probiotics to infant formula. Working in collaboration with the Shanghai Institute of Pediatric Research, scientists from Chr Hansen discovered bifidobacteria and lactobacilli in the breast milk collected from Chinese mothers.

Previous research has shown that breast milk from Western women contains bacteria, including bifidobacteria and lactobacilli. The same has since been assumed of breast milk from women around the world. Seeking to validate this assumption, researchers from Chr Hansen and the Shanghai Institute of Pediatric Research tested for bacteria in breast milk collected from Chinese women.

"We see differences between populations. We see differences in the human microbiome. But the expectation was that we would find bacteria in Chinese breast milk," Mikkel Jungersen, scientific advisor for human health and nutrition, Chr Hansen, told DairyReporter.com. *"The study set out to test whether there are bacteria in the breast milk of Chinese mothers, as we've seen in the breast milk of Western populations."*

"Good reason" to add probiotics
Studies have shown Chr Hansen's probiotic Bifidobacterium strain BB12 may be *"effective in preventing gastrointestinal and respiratory infections in infants and children."* Chr Hansen's portfolio also includes LGG, a lactobacillus probiotic. Many infant formula products available in China already contains probiotics, said Jungersen.

But the study, presented at the European Society for Pediatric Gastroenterology, Hepatology and Nutrition 2015 Annual General Meeting in Amsterdam last week, shows *"bifidobacteria and/or lactobacilli are essential additives to nutritious infant formula,"* he said.

"What we see from this study is that there is good reason to add good bacteria to infant formula to help the infant develop a good gut microbiota. We know they are very important for the development of a healthy microbiota in infants and therefore a good immune system," he said. *"From our point of view, it makes sense to add probiotics to infant formula in order to ensure infants have a healthy development of the guy microbiota."*
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Coffee antioxidants: From bean to brew
NutraIngredients, 05May2015

Australian researchers have tracked the antiradical and antioxidant properties of coffee from bean to brew. The researchers from the Monash University and the University of Melbourne in Australia looked at both the Arabica coffee bean itself and what happened to its stable free radical and antioxidant properties after the brewing process.

Earlier research had suggested roasting coffee beans could destroy stable antioxidants like chlorogenic acids found naturally in the green coffee beans said to protect the body's cells from damage. These antioxidants are replaced with a different class of antioxidants called Maillard reaction products (MRP). Published in the journal *Plos One,* the results of this latest *in vitro* study suggested that a number of stable radical species were formed during roasting and their intensity varied with roasting time and the subsequent grinding and ageing process.

How do you like your coffee?
They said the chemical makeup of the antioxidant activity in coffee brews was *"complex".* Several polyphenols were present in green coffee beans and during roasting these were converted into a plethora of compounds. At the same time, the beans went through the Maillard reaction and browning, which saw a number of compounds with a wide range of molecular weights.

Using electron paramagnetic resonance (EPR) spectroscopy, the researchers saw various changes to the distribution of species when the ground beans were aged for one month in a sample tube. For example the total radical signal detected was increased at roasting times over six minutes. The researchers said this could be due to the gradual decrease in water content during exposure of the grounds to air, leading to improved

microwave penetration depth and number of spins detected. They found the antiradical activity of brewed coffee was dominated by low molecular weight phenolic compounds.
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Euromonitor Forecasts $2.9 trillion packaged food industry
Ingredients Network April 2015
Euromonitor International says that its recent data reveals that the global packaged food industry will grow 2.4% to reach US$2.9 trillion in 2019. Key trends in the industry are:

- The global consumer has a sweet tooth – over 20% of the packaged food we eat today are sweet snacks
- The US is the biggest gluten-free food market in the world in 2014, followed by Italy which represents the largest in Europe
- New policies against obesity affect food players' strategies – the world buys 1.5 trillion calories a day and will be buying 90 more calories a day by 2019

"Snack products are driving the market due to busier lifestyles which makes snacking more prominent in people's diets," said Lianne van den Bos, Food Analyst at Euromonitor. "We will see more companies offer solutions in easy-to-consume, on-the-go formats in the future."
"Health and wellness is also playing an important role in packaged food," said Dimitrios Dimakakos, Euromonitor's Lead Analyst for Western Europe. "Despite the value growth of overall baked goods, staples such as bread suffered a decline in sales over 2014, while the "free-from" food products, such as dairy-free ice cream and gluten-free pasta, are moving from niche channels to mainstream."

"Despite over 40 percent of the global population being overweight and obese, Euromonitor's nutrition data shows that by 2019 the world will purchase 90 calories more a day," said Lauren Bandy, Euromonitor's Senior Nutrition Analyst. "It's important that food players, governments and retailers continue to play their part in providing and promoting healthy products."
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First beef with the goodness of fish
Science Daily May 11, 2015
Chinese scientists have reared beef rich in the beneficial fatty acids associated with fish oils. The study in Springer's journal *Biotechnology Letters* also highlights the scientific challenges that remain.

The team from Northwest A&F University and the National Beef Cattle Improvement Centre, both in Yangling (Shaanxi), successfully introduced a gene into fetal cells from Luxi Yellow cattle, a Chinese breed with a high beef yield. The fat1 gene, isolated from a nematode worm, codes for desaturase enzymes that are involved in the conversion of n-6 to n-3 polyunsaturated fatty acids.

A diet rich in long chain n-3 polyunsaturated fatty acids, also known as omega-3 oils, can help protect against cardiovascular diseases, obesity and neurodegenerative diseases. However, levels of these fatty acids in the human diet have decreased over the years and the levels of shorter chain n-6 fatty acids have increased. Introducing the fat1 gene to cattle increased the levels of beneficial oils by over five times.

"We have provided the first evidence that it is possible to create a new breed of cattle with higher nutritional value in terms of their fatty acid composition," says corresponding author Linsen Zan from the College of Animal Science and Technology at the university.

Other research groups are experimenting with increasing levels of omega-3 oils in farmed fish by creating fishmeal rich in a new plant source. A similar strategy could be used for cattle -- producing feedstock rich in omega-3s -- but the new study shows that elevated levels can be directly produced in beef. Similar genes have previously been introduced to pigs, dairy cattle and sheep by international research groups.

Of 14 calves that successfully received the fat1 gene, 11 died at less than four months old, mainly from inflammation and from an infection common to cattle, haemorrhagic septicaemia. Further research is needed

to determine the causes. Abnormalities may result from the incomplete reprogramming of cells or from some genes being turned on and off during the generation of embryos.

"There is much to learn about the best scientific techniques and the best husbandry required to make beef a rich animal source of omega-3 oils for human nutrition, but we have taken the first step," says lead author Gong Cheng. The researchers believe that the results of their study could help ensure in the future that the beef that people eat is better for them.

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'Consumers are more than ready for pulse bread'
Food Navigator USA, 12May2015

Consumers are familiar enough with pulses for bakers to seriously consider incorporating the ingredient into industrial breads, says Best Cooking Pulses. Pulses – beans, peas, chickpeas and lentils – can be used as a direct replacement for wheat flour in baked goods and significantly increase the amino acid profile of the end product, thus enabling protein claims.

Margaret Hughes, VP of sales and marketing at Best Cooking Pulses, said consumers were familiar with pulses thanks to the boom in snacks, so the potential in bread was huge. *"Consumers are more than ready for pulse bread. In terms of taste profiles, if you look back at baby foods – what is used in baby food? Peas! Pea has a very common taste in people's mouths,"* she told BakeryandSnacks.com.

"Also, the other thing is there have been so many snacks launched recently around chickpeas, beans and peas that consumers are used to it. It's funny, people used to be concerned about the colour of pulses and now they're asking for more colour; more purple, for example. Things change and turn around and what might have, at one time, seemed to be a disincentive actually becomes an incentive."

Better eating
Industrial breads made using pulse flours could be a way of improving the overall diet for consumers, Hughes said, particularly with the protein, fibre and other associated health benefits. *"Especially if you think about food service, there's such a push to get children and adults to eat healthier food,"* she said. *"A protein claim can actually be made very economically with the use of pulse flours. For many products, you can supplement with pulse flours at around 1527% to enhance the amino acid profile and actually have enough quality protein to get a 'source of' claim."* She said pulses also had a rich back catalogue of health benefits, from cardiovascular disease risk reduction to abdominal fat reduction in women.

Tasty bread
Hughes said pulse flours worked on a 1:1 replacement ratio with wheat flours and just simply required moisture adjustment. *"The pulses work really well in bread. You do have to actually adjust your moisture because they hold more moisture, which in some ways has advantages for bakers."*
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Step aside energy drinks: Chocolate has a stimulating effect on human brains, says Hershey-backed study
Confectionery News, 18May2015

Researchers from the Northern Arizona University (NAU) and Arizona Western College (AWC) concluded that dark chocolate confections containing only moderate amounts (60%) of cacao have an acute stimulating effect on the human brain and vasoconstrictive effects on peripheral vasculature. The study published in the journal NeruoRegulation by Michelle Montopoli and others was conducted with support from The Hershey Company that provided chocolate products for the study and reviewed the manuscript prior to submission.

"*Chocolate is indeed a stimulant and it activates the brain in a really special way*," said Stevens, a professor of psychological sciences at NAU. "*It can increase brain characteristics of attention, and it also significantly affects blood pressure levels*," he said in a NAU release announcing the results of the study. The study is the first to examine the acute effects of chocolate on attentional characteristics of the brain and the first ever study of chocolate consumption performed using electroencephalography, or EEG technology. EEG studies take images of the brain while it is performing a cognitive task and measure the brain activity.

Higher alertness

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Ltheanine counteracts blood pressure spike

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Sensory properties of wheat varieties being ignored
Food Navigator, 21May2015

The choice of wheat has a big impact on the sensory properties of bread, but this is largely disregarded, according to research from Universidad Politécnica de Madrid. The study , published in the *Journal of Cereal Science*, shows different varieties of wheat can significantly impact the appearance, texture, taste and smell of bread. Future wheat breeding and selection programmes should take this into account, suggest authors María Jesús Callejo, MaríaEugenia VargasKostiuk and Marta RodríguezQuijano.

"*Until now, wheat sensory properties have not been systematically included as quality parameters in the selection of new wheat varieties… Based on the results of this study, we propose that sensory properties should be considered as breeding criteria for future work on genetic improvement*," said the study's conclusion.
Callejo said: "*The selection of raw materials, considering the organoleptic characteristics that they can provide to the bread, could increase the diversity of final products. This point is very interesting, to create a range of high quality bread products similar to other food sectors such as wine or oil*."

Spelt for choice
The researchers set out to test whether the use of different varieties of spelt wheat would have an effect on the properties of resulting loaves of bread. They looked at spelt because of the growing interest in the varietal, thanks to its perceived health benefits, despite the challenges in both growing and processing the grain. In order to achieve a fair test, the team created strict protocols for both the creation and evaluation of the breads. They selected five different varieties of wheat – two spelt, three bread wheat – all grown in the same region, under the same conditions, harvested at the same time, and milled in the same way, before baking loaves of bread according to the same recipe and process.

For the evaluation, the researchers trained 18 people over four months, training and assessing them for their ability to distinguish consistently between different attributes of bread, across a variety of different tests. Finally they selected a panel of nine, for the final evaluation of the test breads, in the process creating a training protocol they hope could be used in future studies.

Significant differences
"*The tactile texture attributes and most of the appearance attributes were significantly different between breads. Significant differences were found between the spelt breads and those made with bread wheat for the attributes 'crumb cell homogeneity' and 'crumb elasticity'. Considering the odour and flavour attributes together, the bread made with 'Espelta Navarra' was the most complex, from a sensory point of view*," said the study.

Interestingly, while the spelt breads were predicted to have lower elasticity, due to the lower glutenin levels in the grain, both spelt varieties scored highly for crumb elasticity. The authors suggest this could be due to

the “pre-gelatinisation” included in the baking protocol, which was included to promote gluten formation in the spelt breads, and was applied to all the bread types.
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Tree-mendous: NPD boom in plant waters, with 'natural' and 'no preservatives' leading health claims
Food Navigator, 19May2015

Plant waters such as aloe, birch, artichoke, maple, cactus, and almond water are starting to challenge coconut water’s pedestal, with NPD in this emerging category booming, according to Innova Market Insights. The sector’s strength lies in an ability to target two key trends: a desire for inherently natural and healthy drinks in the functional beverage aisle, and millennials who want to hear a story behind what they consume , said Robin Wyers, chief editor at Innova Market Insights. Speaking at Vitafoods Europe in Geneva this month, Wyers said NPD in the category is flourishing, driven primarily by innovation in the US.

Top 10 health claims
Wyers sees drinks across the functional beverage category increasingly positioned around inherent health and nutrition. *“Plantbased waters are the latest emerging segment happening in beverages with the health positioning,”* he said. *“These are positioned on a low sugar, low calorie platform, for their properties from nature and innovative flavours.”*

Across global plant water launches in 2010-2014, ‘natural’ was the top health claim made by products (with 58.6% using the claim). This was followed by ‘no additives/preservatives’ (46.6%) and gluten free (37.9%). Antioxidant claims (27.6%) and low calorie claims (25.9%) were also seen a lot, added Wyers. *“We can also see pretty strong performances for active health– where a nutritional has been added to the product,”* he said. *“These top claims include digestive/gut health, skin health and immune health.”* (These claims were made in 15.5%, 13.8% and 21.1% of launches respectively).

Driven by the US
Plant waters have been growing from a very small base, emerging in strength from 2013, with development predominantly coming from the US, Wyers notes. Coming recently from the continent is maple water and cactus water, positioned clearly on the low calorie platform. Wyers notes two 2014 launches: Bettersweet Maple Water (which boasts *‘35 simple calories with the perfect hint of sweetness’*) and Caliwater All Natural Cactus Water (which says it is *‘lower in sugar and calories than nearly all leading coconut water and aloe juice products’*)

Wyers said: *"This is really interesting as it was not so long ago that coconut water was marketed on this kind of positioning. You can already see there are competitors emerging to that."* But there is also innovation in Europe, particularly with birch water in Scandinavia where birch can be sourced locally, Wyers added.
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Understanding emulsions key to better low fat foods

Food Navigator, 20May2015

Designing low fat foods requires thorough understanding of the many roles that fat plays in the way we experience foods, according to a paper published in *Advances in Nutrition*. Fat is important for the many ways in which we perceive food, including the sensory experience of eating – food's texture, flavour, and appearance – and in helping to provide a feeling of satiety, which can be useful for regulating food intake. However, emulating these characteristics provides a challenge for food manufacturers. This latest paper examines reduced fat foods that use oil-in-water emulsions to cut fat and calorie content, and how they mimic the many properties of fat in foods and drinks. *"The numerous roles that fat droplets play in food quality usually means that a single fat replacement strategy cannot be used to create reduced calorie products with the same desirable attributes as their full-fat counterparts,"* wrote study author Dr David McClements of the University of Massachusetts' Department of Food Science.

"Instead, a combination of different fat replacement strategies is needed to mimic their physicochemical, sensory, and biochemical properties." He suggests that better understanding of fat droplets' multiple roles could help product developers create better reduced calorie foods. Specific approaches include using biopolymer-based ingredients like gelatine, agar, alginate, carrageenan, locust bean gum, pectin, starch, and xanthan, which may improve satiety compared to fats while providing fewer calories; using inorganic ingredients like titanium dioxide, which are not digestible and provide a creamy appearance; or creating structures in foods that mimic fat properties, such as combining fat with air bubbles, polymers or inorganic ingredients, or coating fat droplets in a way that affects their digestibility.

Examples of oil-in-water emulsions include mayonnaise, dressings, sauces, condiments, milk, cream, cheese, yoghurt, nutritional beverages, and desserts. When it comes to reducing the fat content of such products, manufacturers must bear in mind consumer expectations of taste, texture and appearance, as well as their own concerns about cost, labelling and production. *"Of course, it is important to use these technologies wisely so as not to promote passive overconsumption of foods,"* McClements wrote, suggesting that it may be referable to reduce the calorie content of a food component, such as a sauce or dressing, rather than romoting greater consumption of traditionally high-fat foods, like milkshakes or desserts.
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Food Safety & Regulatory News

Front-of-pack labels are equally effective but none works alone
Food Navigator, 21Apr2015

Front-of-pack labelling can be useful but health policymakers are naïve if they think that this alone will result in healthier food choices, say researchers environment, motivation and psychology must be actively influenced too. In a study involving over 2000 participants in four different countries – the UK, Germany, Turkey and Poland – researchers compared three front-of-pack (FOP) labelling systems and how they influenced the perceived healthiness of a product.

Contrary to their expectations, the researchers found little difference in the efficacy of the different systems compared with a basic label, although the presence of any form of nutrition labelling did lead to slight improvements in subjective understanding of healthiness.

The FOP systems under study were the traffic light system, guideline daily amounts, traffic lights and guideline daily amounts together, and a basic label which contained numerical nutritional information alone for comparison purposes. The scientists added each label to three different food categories (pizza, biscuits and yoghurt) which contained three further subcategories (high health, medium health and low health) and two different portion sizes. Consumers were then asked to rate the healthiness of the product they were shown.

Overall, consumers tended to underestimate the healthiness of pizza and yoghurts while they overestimated the healthiness of biscuits. However this was slightly reduced with the presence of the FOP labels a promising outcome, said the researchers.

Coauthor Monique Raats told FoodNavigator: "*This study shows that there is value in having nutritional info there.*" However she added that the results were from lab conditions where participants were shown an image on a computer screen and asked to make a choice without real life constraints such as time, price or packaging.

Does it translate to the real world?
Overall there was a lack of supporting evidence to suggest that the provision of FOP labels led to better food - choices in real world situations although one positive spinoff of FOP labelling in itself was the incentive towards industry reformulation, the researchers concluded.

"Perhaps with hindsight policymakers and the health community in general have been somewhat naive to expect that simply providing nutritional information in the form of FOP labelling alone would result in healthier food choices," said the study. *"Although FOP labels have the potential to facilitate healthier choices, in reality they can only do so when the motivation and intention to shop more healthily has been established."*

"If we are to achieve one single, effective FOP labelling system, future research should perhaps focus on developing a greater understanding of the psychological and contextual factors which impact the motivation and opportunity for people to use the various FOP labels in real world shopping settings," the study added.
They pointed to one study which showed an uptake in healthier food choices following the introduction of FOP labeling in cafeteria – but this was accompanied by signage at the point of purchase, a dietitian on hand to answer consumers' questions and placing the FOP-labelled products at eye level.

Raats said that the team of researchers from the Food Consumer Behaviour and Health Research Centre in Surrey were now looking at whether an understanding of nutritional value affected shopping choices. *"We will teach people how to read the [FOP label] in different ways one indepth and the other not and then see what impact that has on their purchasing choices."*

The study said that the UK FOP labels are fairly well established with a prevalence rate of around 63%, while in Turkey they sit at around 2%.

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Salt set to be next 'bad boy' ingredient in children's food

Food Navigator, 29Apr2015

Manufacturers should act now to reduce salt content in foods intended for children – or risk criticism in the near future, says a Euromonitor analyst. Contributing analyst Simone Baroke argues that while 'low salt' may deter adult consumers from buying certain products, the opposite is likely to be the case for parents of young children. And it is only a matter of time before the media lose interest in sugar and its suggested role in obesity, she claims in a post on Euromonitor's blog.

"The current sugar storm will not last forever – soon another bad boy ingredient will take its place, and it may well be salt," she wrote. The food industry has been scrutinised for the salt content of its products – and with good reason; about 75% of salt in the diet is estimated to come from processed foods. However, consumers tend to associate the words 'reduced salt' with 'reduced flavour', leading salt reduction advocates, like the UK's Consensus Action on Salt and Health (CASH), to suggest a gradual reduction in salt levels to retune taste preferences to a less salty flavour without consumers' knowledge.

"With young children, however, the taste issue poses much less of a hurdle," wrote Baroke. *"A palate that has never grown accustomed to high levels of salt requires very little for a pleasing taste experience, and commercial baby food is usually tightly regulated to contain only very small quantities."*

Parents seeking 'low salt' foods for kids

She added that parents were very likely to start checking ingredient lists carefully for salt levels, from the moment they are informed of the need to restrict their children's salt consumption. *"Manufacturers need to act fast if they want to avoid criticism, and now is also the time to prepare their portfolios to include more products for young children explicitly positioned as being low in salt."*

According to UK recommendations, children aged 13 should consume no more than 2 g of salt per day, rising to 3 g for those aged 35 and a maximum of 5 g for those aged 71. A CASH study carried out in March this year found that 28% of 'family friendly' UK restaurant foods aimed directly at children contained more than 2 g of salt per serving. Meanwhile, an Australian study found that children there aged four to eight consumed an average of 5.1 g of salt per day – above the 5 g the World Health Organisation recommends as a maximum healthy amount for adults.

"The message that children eat far too much salt and that it primes them for serious health conditions in the future is a media frenzy waiting to happen," said Baroke. *"Research shows that the problem is widespread, and that packaged food is the prime culprit."*

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Engineers and scientists to examine antibiotic resistance in food chain from farm to fork

20 May 2015 Medical News Today
Growing evidence suggests that agricultural practices, especially widespread **antibiotic** use, could be contributing to the increasing antibiotic resistance problem in humans. In order to learn how to effectively control this spread of antibiotic resistance from livestock manure, the U.S. Department of Agriculture (USDA) has awarded a $2.25 million grant to a Virginia Tech team of engineers and scientists to examine the food chain from farm to fork.

One of the team's immediate concerns is to determine if the proposed Food and Drug Administration's (FDA) Food Safety Modernization Act rules for composting manure, intended for the control of pathogens, will effectively limit the spread of antibiotic resistant bacteria. The team's plan includes tracking the fate of antibiotics, antibiotic resistant bacteria, and antibiotic resistance genes, as they are potentially carried over from manure to fresh produce.

Leading the interdisciplinary group is Amy Pruden, professor of civil and environmental engineering and associate dean in the graduate school at Virginia Tech, a pioneer in examining environmental sources and pathways of antibiotic resistance genes as emerging contaminants. A 2007 Presidential Early Career Award in Science and Engineering and a 2006 National Science Foundation CAREER Award recipient, Pruden was also honored with the 2014 Paul L. Busch Award from the Water Environment Research Foundation for innovation in applied water quality research.

Last September President Barack Obama signed an executive order establishing a Task Force for Combatting Antibiotic-Resistant Bacteria. The task force creation came on the heels of a President's Council of Advisors on Science and Technology report on ways to fight antibiotic resistance in the U.S. Part of this report spoke of the "very serious concern" of antibiotic use in animal agriculture.

"Antibiotic resistance is a serious human health threat," Pruden said. "Our goal is to identify all possible means by which we can control the spread of antibiotic resistance so that these drugs continue to work when we need them. In this case, we hope to work with existing practices intended to control the spread of pathogens from livestock manure and to determine how we can ensure that antibiotic resistance also is not s pread."

Evidence is showing that antibiotic resistance rates of human pathogens is rising in both hospital acquired and community acquired infections. While looking at ways to minimize the spread of resistance, "the fact that the majority of antibiotic use in the U.S. is for livestock cannot be ignored," Pruden added.

The Food and Drug Administration recently estimated that 80 percent of antibiotics used in the U.S. are administered to livestock. Combine this fact with the knowledge that between "40 and 90 percent of the antibiotic is excreted in the feces and urine where they can remain active and potentially stimulate antibiotic resistance," cautioned Kang Xia (http://www.cses.vt.edu/people/tenure/xia.html), associate professor of crop and soil environmental sciences (www.cses.vt.edu) at Virginia Tech and a co-principal investigator. And it reinforces "our call for new strategies."

In the U.S., antimicrobials are widely used for therapy, disease prevention, and growth promotion in animals raised as a source of food. "They generally act by targeting specific aspects of the bacterial cells and inhibiting their growth," Pruden explained. "However the bacteria can become resistant to antibiotics when they carry antibiotic resistance genes."

So the Virginia Tech team is focusing on these genes "since they can be shared among bacteria, even dead to living bacteria, and could therefore persist during pre-harvest and post-harvest stages," said Pruden. "Antibiotic resistance genes are arguably of greater concern than antibiotic resistant bacteria because they are typically associated with mobile genetic elements that enable them to be passed between microorganisms via horizontal gene transfer, a phenomenon possible even from dead to living cells." Pruden points out that "horizontal gene transfer is considered to be the most important mechanism driving the spread of antibiotic resistance".

Monica Ponder, an associate professor of food science and technology at Virginia Tech, also a member of the team, noted concerns about produce eaten raw, as vegetable surfaces are naturally colonized by a variety of

bacteria, yeasts, and fungi. Most are harmless, but when they do occasionally carry pathogens, the results can be deadly, as was the case in the 2006 outbreak of Escherichia coli O157:H7 linked to spinach. This contamination can come from lapses in manure management, such as contamination of irrigation water, poor composting, or application too near the harvest time.

"In the U.S., it is not permissible to apply raw manure to fields intended for food production, but there may be simple ways we could improve the composting process, selection of soil type, crop type, or post-harvest washing practices to ensure that antibiotic resistance is not spread," Ponder emphasized.

The Food and Drug Administration has already launched an initiative to promote voluntary phase out of medically important antibiotics such as third generation cephalosporins in food producing animals. "While limiting antibiotic use in livestock makes sense from a practical standpoint, the science of the effect of antibiotic withdrawal on antibiotic resistance is complex" and other undesirable effects may occur,said team member Katharine Knowlton, the Virginia Tech Colonel Horace E. Alphin Professor of Dairy Science.

The new USDA project will integrate research, education, and extension in order to train future leaders equipped to address complex problems like the spread of antibiotic resistance in the environment and to engage with farmers and livestock producers in translating the research to practice.

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Devices designed to identify pathogens in food

27 May 2015 Medical News Today
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The tool could detect whether a product is free of microorganisms like **E. coli** or salmonella.

Researchers at the National Polytechnic Institute (IPN) in Mexico, developed a technology capable of identifying pathogens in food and beverages. This technique could work in the restaurant industry as a biosensor to detect in what conditions food is before being eaten in order to avoid possible gastrointestinal diseases.

Abdu Orduña Diaz, a researcher at IPN, carried out this work on the microfabrication of biosensors, devices with applications in biology. This system can be developed to identify pathogens in food or beverages, as well as analysis the presence of pesticides in the agricultural sector.

The biosensor is an analytical tool or system composed of a biological material that may be an enzyme, antibody, DNA, whole cell, organelle, or combinations thereof. Once it comes into direct contact with a transducer system (device) it converts the biochemical activity to be analyzed in a quantifiable signal (indication).

Within the classification of biosensors there are optical and electrochemical.

The specialist of the Center for Applied Research in Biotechnology (CIBA-Tlaxcala) of the IPN explains that in the development of this technology spectroscopic techniques are used such as infrared which is a versatile non-destructive, easy technique to use and is based on the interaction of radiation with matter. It is a controlled radiation that does not affect the person who handles it.

"When radiation interacts with matter it generates reactions. We analyze them and obtain information on the sample investigated. Such techniques can be applied in the development of optical biosensors," indicated the Polytechnic specialist.

One application would be focused on the detection of pathogens in food. This technology could work in the restaurant industry as a biosensor capable of detecting under what conditions is the food before eating in order to avoid possible gastrointestinal diseases.

"The tool could tell us whether the product is free of microorganisms, which may be the case of bacteria such as E. coli or salmonella."

The investigation is in an intermediate step of the analysis of materials transducers (devices) and in the near future could become a reality, once the ability to "build" thousands of BioMEMS -shaped as chips - so they are commercially feasible and the consumer can purchase at low cost.

This technology could also be applied in the detection of toxins or pesticides, because it is a problem that the Mexican countryside has, the uncontrolled use of such substances.

Currently, scientific research work and collaboration with the Mexican National Institute of Astrophysics, Optics and Electronics (INAOE) are performed, whose specialists provide expertise for the manufacture of z microelectromechanical systems (MEMS), analysis, and characterization of amorphous semiconductor materials, and in the design of integrated circuits and others.

"This collaboration has allowed us to find new methodologies for the development of electrochemical and optical biosensors, specifically applied in the food area. The technology could have many applications, such as quality control of finished products, for example in perishable food imports it may serve to verify the conditions under which they are stored.

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Link of green tea extracts to liver injury raises age old question: How much of a good thing is too much?
NutraIngredients, 12May2015

Botanical ingredient experts are not surprised by a recent report on the association of green tea extracts with liver toxicity. It's consistent with recent literature and could serve as a warning sign of the potential dangers lurking in the pharmaceuticalstyle, reductionist approach toward botanical ingredient development.

The recent report was delivered as a talk by Herbert Bonkovsky , the chief of hepatology at Wake Forest University School of Medicine at a workshop on liver injury from herbal and dietary supplements hosted by the National Institutes of Diabetics and Digestive and Kidney Diseases and the American Association for the Study of Liver Disease. In particular, epigallocatchin gallate (EGCG) – the most abundant, active and toxic catechin in green tea – appears to be the culprit when it is highly concentrated in extracts, Bonkovsky explained.

Caution on extraction
It's important to distinguish between green tea as a source material and the individual constituents of the plant, herbal products experts told NutraIngredients USA. *"I'll confirm that there are a number of case reports of supplements containing green tea extract being associated with liver damage. The case reports are associated with supplements containing concentrated green tea catechins. There are no known reports and there is no concern about green tea as a beverage,"* said Mark Blumenthal, executive director of the American Botanical Council. An article in the organization's HerbalGram publication has explored the matter in depth, Blumenthal said.

"The research that was reported at the meeting is completely consistent with the historical literature over the past 20 years," said Roy Upton, founder of the American Herbal Pharmacopoeia. *"There are at least 20 cases of liver injury associated with green tea supplements that we know of."*

Upton said that one of the difficulties in dealing with teasing out what exactly causes the liver issues associated with dietary supplements is the wide variety of product matrices and the wide variety in how the products are used by consumers. Many of the highly concentrated green tea extracts appear in weight loss products, which brings with it its own set of issues. It's a category sadly rife with adulteration in the form of undeclared active pharmaceutical ingredients. Was the liver trouble perhaps caused by one of these?

"If we were to look at the products that were actually consumed, my herbal bias is suggesting that they were probably either pure EGCG products or were spiked with caffeine. These products have higher EGCG concentrations, concentrations you would never achieve drinking green tea. It was the same thing with ephedra; you had very rare adverse event reports from people using ephedra in its raw form or in crude, low concentration extracts. As far as I know, nobody has looked at all of the green tea case reports for issues like these," Upton said.

Rick Kingston PharmD, a clinical professor of pharmacy at the University of Minnesota, echoed Upton's concerns. Case reports included in the National Liver Injury Database vary in detail and quality, making it difficult to paint an accurate statistical picture.

"The challenge still remains to figure out when is it the product effect and when is it the ingredient effect, especially when it is a product with multiple ingredients," said Kingston, who is also president of regulatory and scientific affairs at SafetyCall International.

"Studies about green tea extract and liver injury are generally inconclusive and highlight the need for experts from various fields to collaborate in order to develop more definitive conclusions. It is important to bring together the expertise of medical doctors, pharmacognosist, toxicologists, analytical chemists etc., to reach an accurate understanding of the impact of green tea extract on the human liver," said Maged Sharaf PhD, chief science officer of the American Herbal Products Association.

Usage questions

Another issue with products in the weight loss realm is that consumers are typically using them in a mode where they are not behaving as they usually do in a dietary sense. The products are taken to help in changing the consumer's base state, not to support his or her overall health. What might the subject of a case report have been eating (or perhaps more importantly, not been eating) at the time the green tea supplement was ingested?

"The presumption is that people are taking these EGCG containing supplements on an empty stomach. Concentrated catechins that hit the liver in a fasting state might have an effect that is different than when the liver is metabolizing food. People in a fasting state could be associated with the mechanism of injury, whatever that mechanism is, assuming there is a there," Blumenthal said.

Bill Gurley PharmD, a professor in the College of Pharmacy at the University of Arkansas School of Medicine, said those behavioral questions are a key part of understanding how dietary supplements could potentially be misused. The category's halo of overall safety, one of the attributes that industry advocates like to trot out when comparing supplements' liver injury record vis-à-vis common drugs like acetaminophen, could work against it when dealing with consumers desperate to lose weight, consumers who might think another couple of green tea pills couldn't hurt them. There doesn't seem to be as much respect among consumers for dosage recommendations for dietary supplements as there would be for drugs, Gurley said.

"If you look at it strictly from the point of view of how different green tea is being consumed now as to opposed to how it has been consumed over the last few thousand years it's quite different," Gurley said. *"When you start taking it in the form of capsules people have the tendency to overdo, and some of those who do overdo might have the wrong genetics for these sort of things. They might be more susceptible. It's more about the dosage form and the practical questions of how we ingest those dosage forms as opposed to the traditional form,"* he said.

Traditional vs Modern

For Upton, the issue points to the difficulties associated with taking traditional herbal medicines and seeking to make them better via more pure extracts or even taking them down to individual active molecules. People in the industry talk a lot about the synergistic effects of the complex matrices of phytochemicals present in many botanical materials. Those are difficult to quantify and fit into a drug test model, but they appear to be real, Upton said, and may have protective or buffering qualities.

"These high EGCG extracts are more like a drug derived from green tea," Upton said. *"Green tea is drunk like crazy in China. A typical Chinese consumer might drink eight to 15 cups a tea every day for their life, and you don't see hepatotoxicity associated with its use even at high doses in its whole form. It's our manipulation of these extracts that appears to be doing it, and maybe some idiosyncratic reactions on the part of some users. This manipulation is what gets us into trouble and gets us away from our mission of promoting health naturally."*

"You can pretty much say that about any dietary supplements for that matter, not just green tea. Via these extracts we are being exposed to a unique set of phytochemicals in high concentrations. The research lags so far behind the development of these unique combinations. A lot of these botanicals have a good track record on safety but that's when they are consumed in the traditional approach. It's the old adage of everything in moderation," Gurley said.
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EFSA adopts caffeine opinion
NutraIngredients, 28Apr2015

The European Food Safety Authority (EFSA) has adopted its opinion on the safe consumption of caffeine with little change to its controversial draft after a heated debate period. The NDA *(*Dietetic Products, Nutrition and Allergies) panel discussed the opinion last week at an open plenary after intense debate the month before with stakeholders including national authorities, consumer groups and trade associations. The meeting followed a feedback period where stakeholders could formally submit comments.

The final edit is due to be published by the end of May. A spokesperson for the authority told us no major changes had been made and the main conclusions remained: Up to 400 mg of caffeine a day and 200 mg in a single session (two hours) does not pose a health risk for general population adults. For pregnant women, consumption should not exceed 200 mg a day to ensure there are no risks for the unborn baby. The final conclusions for caffeine in combination with alcohol were also unchanged, stating there was no evidence of interaction between alcohol and caffeine.

The spokesperson said: *"The Panel was only looking at safe limits of caffeine in combination with alcohol at a 'normal' drink driving limit and did not consider interaction of energy drinks with binge drinking."* This had been a point of some contention in the previous stakeholder meeting. Germany's Federal Institute for Risk Assessment (Bfr) challenged whether EFSA's conclusion on this failed to account for real life situations of nightclub culture where high consumption of energy drinks mixed with alcohol was common among young people.

The final document would also stand firm on its use of both body weight and absolute values, something some said could cause difficulties for sports nutrition formulation. This body weight formula was also used to derive safe limits for children and adolescents, for which EFSA said there was limited data. The panel used acute caffeine consumption in adults based on body weight (3 mg/kg bodyweight per day) as a basis for single doses of caffeine and daily caffeine intakes of no concern for these subgroups. The panel also maintained that the same single dose of caffeine was not a concern when consumed less than two hours before intense exercise *"under normal environmental conditions".*

Industry has been waiting for years for this opinion. Energy drink manufacturers hoped it would give clarity in an age when the sector had received intense bad press. Others hoped it would shed light on caffeine health claims that have been approved by EFSA but remain stuck in the EU food law backwaters due to member state concerns over public health. The draft opinion, released in January, didn't satisfy everyone though. The European Consumer Organisation (BEUC) warned the daily upper safe limit which equated to about five energy drinks could send the wrong message to consumers. BEUC and member states authorities questioned why more conservative national risk assessments had been set aside.

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UK spreads DNP warning on Twitter

NutraIngredients, 04May2015

The UK's Food Standards Agency (FSA) has urged Twitter users to help it spread the word on the dangers of toxic fat burner DNP after a young woman died last month. The authority said DNP (2,4dinitrophenol) continued to be sold and consumed in capsule and powder form.

"This can and does kill. That's why we are urgently warning the public not to take any tablets, capsules, powders or liquids containing this deadly ingredient. DNP is an industrial chemical that is not fit for human consumption," it said in an announcement. It urged the public to help it *"spread the word to prevent another death"* with the social media hashtag #DNPkills.

The campaign follows the death of Eloise Aimee Parry, a university student from Shrewsbury, who died after taking eight tablets that contained DNP last month. She was said to have bought the product online. The 21 year old was the latest of several fatalities related the substance over the last few years. Its youngest known British victim was 18 years old. DNP is used by those looking to lose weight as well as the body building community.

It burns fat by speeding up metabolism to a dangerously high level and at best induces nausea, vomiting, restlessness, flushed skin, sweating, dizziness, headaches, rapid respiration and irregular heartbeat. At worse it can put the user into a coma or lead to death.

The FSA said consuming lower amounts over a long period of time could lead to cataracts and skin lesions and affect the heart and nervous system. The substance is banned or has been officially warned about in many countries including the UK.

The FSA will be tweeting to raise awareness from its @foodgov account in late April and early May. The warning tweets focus on DNP's weight loss and body building uses, asking: *"Are you dying to be thinner?"* and *"Killing yourself to be bigger?"* The campaign is supported by UK eating disorder charity Beat.
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