> VOLUME 3, ISSUE 1 > SPRING 2015

Canadian*food*Insights

PART 1 OF 4

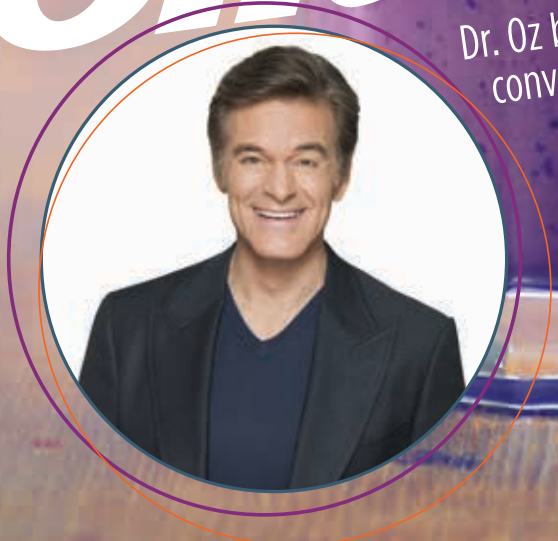
Regulatory Arena

Legal expert Sara Zborovski explores the clean label

+

super Smoothies

Dr. Oz blends health and convenience in one glass



The official magazine of
CIFST
www.cifst.ca

NON-GMO

Sunflower Oil

A non-GMO oil ideal for product formulations

Two premium choices:
Mid Oleic (NuSun®) and High Oleic Sunflower Oil

Both oils have:

- superior stability and extended shelf-life
- a longer fry-life[1] than other oils
- a light, neutral taste, offering a clean flavour profile
- heart health benefits – trans fat free and an excellent source of Vitamin E

Call one of the following suppliers to determine which sunflower oil is right for *your* application:

ADM
800-637-5843

Bunge Oils (Canada)
800-361-3043

Caldic Canada Inc.
800-263-1939

Cargill
800-263-5573

C.P. Vegetable Oil Inc.
800-431-3731

Fazio Foods International Ltd.
604-253-2668

Hubbert's Industries Ltd.
905-791-0101

LV Lomas Ltd.
800-575-3382

Northern Alliance Commodities
519-979-3800

Sager Food Products Inc.
514-643-4887

Saporito Foods
905-944-0505

TAKTIK Marketing
514-389-2553

Trade Organics USA, LLC
888-210-2599

National Sunflower Association

Buy USA Sunflower Oil | SunflowerNSA.com

NuSun® is a registered trademark of the National Sunflower Association.

1. Fry study conducted by Cargill, spring 2009.
2. Research conducted by IPSOS-ASI Ltd., January 2010

75% of Canadians[2] are interested in buying products made with sunflower oil.

Affordable Titration Systems

HI 902C
Automatic Titration System

HI 921
Autosampler

The **HI 902 Titrator** is a powerful system for performing potentiometric titrations. HI902C can perform acid-base, redox, complexometric, precipitation, back titrations and titre determinations. It dispenses titrant, detects the endpoint and performs all necessary calculations automatically. This versatile titrator supports up to 100 standard or user-defined methods.

The **HI 921 Autosampler** is an automated titration sample handling system designed for use with the HI902C Potentiometric Titration System. This high quality system makes the titration of multiple samples quick and easy.

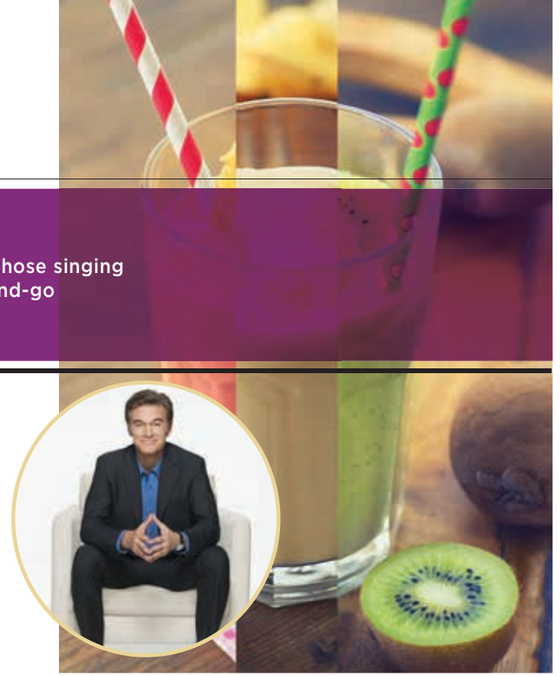
In conjunction with the HI 902, the Autosampler allows you to titrate up to 18 samples at one time. The HI921 can utilize up to three peristaltic pumps and one diaphragm pump or reagent addition, sample leveling, and waste aspiration. It also features a built-In magnetic stirrer, reagent addition, electrode rinse feature, USB interface with compatible barcode reader and built-in RFID for each tray.

titration@hannacan.com

HANNA® instruments
CANADA

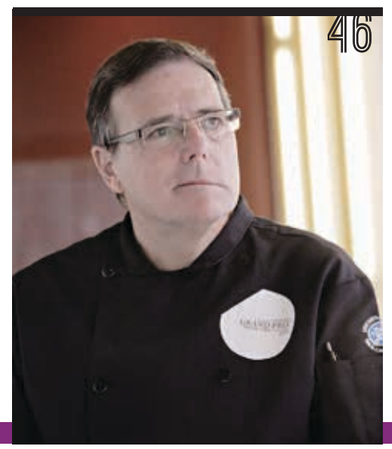
Smoothie Craze 14

Dr. Oz adds his voice to those singing the praises of the grab-and-go blended beverage.



feature stories

regular departments



feature REVIEWS

Canadian food Insights
www.cifst.ca
SPRING 2015, Volume 3, Issue 1

2014 Kenneth R. Wilson Awards Finalist

EDITOR-IN-CHIEF Michael T. Nickerson mtn620@mail.usask.ca
EXECUTIVE EDITOR Theresa Rogers trogers@dvtail.com
MARKETING & COMMUNICATIONS, CIFST Ann Manley amanley@cifst.ca
CONTRIBUTORS Darren Korber, Suley Muratoglu, Jennifer Neate, Michael Nickerson, Martin Scanlon, Stuart Smyth, Natallia Varankovich, Aleksandar Yovchev, Sara Zborovski
STAFF WRITER Hermione Wilson hwilson@dvtail.com
EDITORIAL INTERN Lekha Kanagasabai
ART DIRECTOR Katrina Teimourabadi kteimo@dvtail.com

ADVERTISING SALES
SALES MANAGER Beth Kukkonen bkukkonen@dvtail.com
SENIOR ACCOUNT EXECUTIVE Gillian Thomas gthomas@dvtail.com
V.P. PRODUCTION SERVICES Roberta Dick robertad@dvtail.com
PRODUCTION MANAGER Crystal Himes chimes@dvtail.com
PRODUCTION CO-ORDINATOR Joanna Forbes jforbes@dvtail.com
DOVETAIL COMMUNICATIONS PRESIDENT Susan A. Browne sbrowne@dvtail.com

Published by:
Dovetail Communications Inc.
30 East Beaver Creek Rd., Suite 202,
Richmond Hill, ON Canada L4B 1J2
905-886-6640
Toll-free 1-888-232-2881
www.dvtail.com
For:
Canadian Institute of Food Science and Technology
3-1750 The Queensway Suite 1311
Toronto, ON Canada M9C 5H5
905-271-8338
Fax: 905-271-8344
www.cifst.ca

follow us @CDNFood

THERESA ROGERS

EDITOR FOR

CANADIAN FOOD INSIGHTS

UNDER ATTACK

DO YOU EVER FEEL LIKE YOU ARE UNDER ATTACK? I can feel you all reading this and telling me, "Yes!"

It's no wonder. I consider myself an informed person and I admit to feeling bombarded lately by news, documentary and consumer programs attacking the food system in various ways. In the past few weeks alone I've seen programs about wheat, orange juice and lousy labelling. Add to that the onslaught of sometimes contradictory nutrition studies and the system goes haywire. What is the average consumer to believe?

Loblaws has a funny take on the issue in a new commercial where consumers are bombarded by various conflicting news stories telling them to avoid this and add that. The commercial promotes the retailer's commonsense Guiding Stars program.

Is it any wonder then that consumers often don't know what to believe when it comes to the science behind food? Mark Kelley explores this theme in his *Fifth Estate* piece called The War on Wheat. Is gluten bad for you, he asks? No, the experts all reply. Why then are people more inclined to listen to celebrities – possibly the worst sources from which we should be gathering our health information – than scientists? "The truth is not easy to sell. The truth is not sexy. The inconvenient truth of healthful living is that it does require effort," answers Dr. Yoni Freedhoff, who is often referred to as one of Canada's most outspoken obesity experts and dubbed a "nutritional watchdog" by the *Canadian Medical Association Journal.*

William Davis, father of this latest movement, is to anti-wheat as Jenny McCarthy is to anti-vaccine and he blames big food companies and big government. "I'm waging a war against misinformation in health in which one of the major and most destructive messages is to create a diet rich in healthy whole grains." Huh? That doesn't even begin to make sense to me.

This is why I'm excited about this edition where we bring a lot of these issues together for you. Our scientific reviews on adding probiotics, salt reduction in baked goods, and GM labelling are all super-relevant. Our law expert tackles clean labelling in her story and then Dr. Oz, the quintessential doctor/celebrity spokesperson, brings it all together in our smoothie trend story.

As with everything in life, moderation is key. A good dose of common sense will get you further than an extra helping of carbs, it seems.

Sincerely

THERESA ROGERS

Michael T. Nickerson, Ph.D., P.Ag.

SASKATCHEWAN MINISTRY OF AGRICULTURE RESEARCH CHAIR

(Protein Quality and Utilization)

Department of Food and Bioproduct Sciences
University of Saskatchewan

Welcome back everyone to the first issue of 2015 of *Canadian Food Insights*. This year is going to be an exciting one for the Canadian food and beverage sector as focus shifts toward developing cleaner labels, the next generation of consumers, higher quality proteins, pulses and health promotion. In this issue we feature three exciting new mini-reviews. The first is entitled, *The impact of salt reduction in baked goods,* and focuses on reducing sodium levels in products to meet new targets set by Health Canada without comprising quality. The second focuses on *Maintaining gut health with probiotics* and explores some efficacy issues surrounding health claims. And finally, the third is entitled, *The food industry's conundrum about GM labelling,* which provides insights on the rise of the GM labelling issue in North American. Our Regulatory Arena section introduces the concept of clean labels to our readers to kick off a year-long theme on the topic from a regulatory and legal perspective. The rest of this issue is jam-packed with exciting stories from across Canada that will be sure to whet your appetite for more. A special thanks to my entire team, to our editorial board, and to Dovetail Communications, for continually making *Canadian Food Insights* possible. I also want to officially welcome Theresa Rogers as our new editor from Dovetail Communications, whose experience and vision will continually help *Canadian Food Insights* to reach new heights.

Sincerely

Michael T. Nickerson

food EVENTS 2015

April 9-12
Canada Health Food Association Expo
VANCOUVER, BC

April 9-14
Natural Food Health & Food Products Conference: CHFA West 2015
VANCOUVER, BC

April 10-12
Good Food and Drink Festival
TORONTO, ON

April 15-17
Canada Produce Marketing Association Convention
MONTREAL, QC

April 28-30
SIAL Canada 2015
TORONTO, ON

April 28-30
Food Safety Summit, Expo & Conference
BALTIMORE, MD

May 19-21
Sweets & Snacks Expo
CHICAGO, IL

May 31-June 1
Bakery Congress Conference & Trade Show
MONTREAL, QC

PEOPLE PROFILE

Mike Fata of Manitoba Harvest Hemp Foods Crowned Prairies Entrepreneur of the Year

This year's winner of the EY Entrepreneur of the Year Prairies – Manufacturing award is Mike Fata, Co-founder and CEO of Manitoba Harvest Hemp Foods, the world's largest hemp food manufacturer to grow, make and sell its own brand of hemp food products.

Entrepreneurs from across the Prairies were judged based on their vision, leadership, innovation, financial performance, community engagement, and personal influence. The judging panel consisted of educators, business and community leaders, and past winners.

"Twenty years ago when a hemp foods company was simply a dream, I never could have imagined we would be where we are today," says Fata. "Now that I know anything is possible, I wish I had dreamt bigger!" Fata was also selected for the national Entrepreneur of the Year Special Citation for Entrepreneurial Spirit.

Fata and his fellow co-founders started their business by partnering with farmers, government agencies and local retailers to work on building consumer demand. "There was no hemp foods industry back then so we really had to create an industry along with a company," he says.

Manitoba Harvest has grown over 500 per cent in the past five years, and is the largest vertically integrated hemp foods manufacturer in the world. The company is poised for continued growth, having just completed a facility expansion that nearly triples manufacturing capacity.

Despite its huge successes, Manitoba Harvest still remains aligned with Fata's initial goal – to introduce consumers to the health benefits of hemp foods.

"I was an overweight, unhappy teenager," says Fata. "Hemp foods played a crucial role in transforming my life and I wanted to share them with everyone. After my co-founders and I helped legalize industrial hemp in Canada, starting a food company was the natural choice because it aligned with my passion for nutrition."

FREE BEVERAGES OFFERED TO RESEARCHERS

Ann Payne's Caveman Foods Ltd. recently announced it would provide up to 12 cases (or 144 individual servings) of its raw, unpasteurized drink, shipped free to Canadian universities or labs for studying the link between unpasteurized fermented foods and gut bacteria.

Gourmet foodies have long been searching out the fresh, unpasteurized drink known as water kefir for its taste and unparalleled ability to combine with food, but what is less generally known is that unpasteurized fermented drinks also have the ability to control sugar cravings.

Is there a link between unpasteurized fermented foods and gut bacteria?

"The Weston A. Price organization in the USA has done a terrific job of explaining to people how raw, fermented foods help maintain a healthy weight and a strong immune system," says Leslie Payne-Zimmer, of the Toronto-based company. "We have had anecdotes from our customers telling us that our drink has helped them lose those last few pounds. However... the connection between controlling a sweet tooth and our drink has not been fully tested under controlled conditions."

Getting More Canadian Food onto the Chinese Retail Shelf

Chinese retailers want to stock more Canadian foods, but Canadian exporters are being largely out-flanked by competitors in getting space on supermarket shelves and exposure on China's e-commerce sites, concludes a report released by the Canadian Agri-Food Policy Institute (CAPI).

The report is based on CAPI's networking trip to China last November that introduced Canadian companies and organizations to selected retailers in Beijing and Shanghai. Based on first-hand exposure to some leading Chinese retailers, CAPI's report proposes several strategies in order to further Canada's presence in the international market:

- Canadian food companies not already exporting to China should initially target "one grocery retailer in one Chinese city" to gain entry into this vast marketplace.
- Canada needs to leverage its brand and develop a "Canada Online Food Festival" in order to give Canadian companies the advantage of promoting their products to Chinese consumers and level the playing field with other exporting countries in the growing e-commerce market.
- More needs to be done by trade associations and governments to clarify the export/import process, and facilitate regulatory approvals in China, particularly for new or niche food exporters.
- A new government-business dialogue is required to evolve Canada's China strategy in order to double Canada's value-added agri-food exports; differentiate Canadian foods, beverages and ingredients from our competitors; and respond to the changing trade access being achieved by others.

After tainted food scandals in China, grocers wish to satisfy ever-rising consumer expectations that food is safe and sourced from or produced in a clean environment, attributes that Canada's brand can leverage in seeking greater prominence among retailers.

MANITOBA COULD REDUCE ANNUAL HEALTH CARE COSTS BY $400 MILLION THROUGH INCREASED CONSUMPTION OF FUNCTIONAL FOODS

According to the recently completed study, "Economic Impact to Manitoba of Increased Adoption of Healthy Food and Food Ingredients for Chronic Disease Management and Mitigation," there could be substantial potential savings of between $360 to 400 million annually to the health care system in Manitoba by changing eating habits to include more functional foods – a reduction of more than 10 per cent of the annual health costs in the province.

Agriculture economist Maria Jose Patiño Valiente, MSc, used the Canadian Climate Advantage Diet (CCAD) model as the basis for determining the economic impact of increased consumption of functional foods on health care costs associated with diabetes and heart disease. CCAD promotes the health benefits from increased consumption of Canadian-grown and processed crops and livestock products.

Funded by the Canadian and Manitoban governments through Growing Forward 2, a federal-provincial-territorial initiative, plant and animal-based bioactive compounds are tested and assessed, from isolation and characterization through clinical proof of safety and efficacy to product development and commercialization. The CCAD has at its foundation the validation of the benefits from increased consumption of high quality crops and healthier animal-based products (including canola oil, flaxseed, pulses, whole grains, potatoes and emerging crops, eggs, dairy, turkey, bison, freshwater fish, honey and grass-fed beef).

food EVENTS 2015

June 3-5
World Pork Expo 2015
DES MOINES, IA

June 14-18
12th International Congress on Engineering and Food
QUEBEC CITY, QC

June 15-17
Canada Poultry and Egg Processors Council Convention
TORONTO, ON

COMPANY PROFILE

Eating Healthy, Simply

MEAL PLANNER PRO LAUNCHES FREE, HEALTHY MEAL PLANNING SOLUTION

Meal Planner Pro, a tech startup based out of Edmonton AB, is a free, comprehensive health and nutrition website that brings an end-to-end meal planning solution to the table. With personalized planning tools, more than 800,000 recipes, and 70,000 brand name grocery products, Meal Planner pro aims to help busy families plan meals, create grocery lists and eat healthier.

"Current online meal planning resources and content are highly fragmented, making it difficult to organize and plan healthy meals," explains Founder and CEO, Commodore Allen. "Healthy meal planning and grocery list creation is so much easier when you have everything you need in one place."

Meal Planner Pro acts as a one-stop shop for healthy solutions. Meal planning is simplified with personalized tools and features that consider each family member's unique dietary goals and needs, including food allergies, intolerances and various health conditions such as heart health, diabetes, and weight management.

"Although Meal Planner Pro was designed for anyone that wants to eat healthier, my drive to create the site comes from my personal experience with diabetes," says Allen. "All of us at Meal Planner Pro are passionate about making it easier for people to manage their health through diet and nutrition."

Allen says the site offers some powerful nutrition analysis tools that do all the heavy lifting to reveal what's good and bad about every food product. The ProScore System, developed by registered dietitian Jennifer Livingstone, scores food products from 1 to 100 based on their nutrition values, ingredients, and how well they match with the user's preferences and nutrition goals.

Meal Planner Pro has also created two websites in order to acknowledge the differences in nutrition guidelines between the United States and Canada – www.mealplannerpro.com and www.mealplannerpro.ca – and both are supported by advertising. An ad-free version is also available for a low monthly fee, which offers additional features and content such as exclusive recipes and added search options, making it easier for people to shop, cook, plan and stick to a healthy lifestyle.

With a strong foundation, now the focus is on personalization and money-saving features. For example, U.S. users can see recipe ingredients on sale at their local grocery store. Allen says, "Longer term goals are to develop our consumer insight capabilities to enable food manufacturers and recipe content providers to create healthier foods and recipes and to provide a full personalized meal planning service."

FOOD PRICES TO RISE SHARPLY IN 2015

Experts anticipate more than $40 billion in food product imports this year, a rising figure due to several factors says a new report. The recent closures of several Ontario food processing plants, such as Kellogg Co., have resulted in an increase in cereal imports of 18%. The weakened Canadian currency will see increased prices on food products of 0.7% to 3.0% overall, especially on imported items such as fruits, vegetables, and nuts. Fluctuations in prices will have a particularly negative effect on vegetables, as there is a lack of substitutions on edible imported products. Making up nearly a quarter of the average Canadian household's food expenses, the prices of vegetables are predicted to increase anywhere from 5.5 per cent to 7.5 per cent by the end of 2015.

The Food Institute of the University of Guelph first released the annual retail price report in December 2014 when the Canadian dollar was worth $0.88 against the American dollar. Since the Canadian dollar's sudden fall, primarily due to the low crude oil prices and lower interest rates, the Food Institute made the decision to revise the food retail price forecast for 2015, published on February 3, 2015.

LIKELY INCREASE OF
0.7 – 3.0%

June 23-25
International Scientific Conference on Probiotics and Prebiotics
BUDAPEST, HUNGARY

July 11-14
IFT15 (Institute of Food Technologists)
CHICAGO, IL

Sept 14-16
World of Food: India
MUMBAI, INDIA

Sept 30 - Oct 2
Sourdough and Cereal Fermentation Symposium
NANTES, FRANCE

RESEARCH COLLABORATION TO COMBAT DEADLY DISEASE FOUND IN PIGS

A research funding group consisting of Genome Alberta, Alberta Livestock and Meat Agency, Genome Canada, the Ontario Ministry of Agriculture, Food and Rural Affairs, Saskatchewan Ministry of Agriculture, Canadian Food Inspection Agency, Ontario Genomics Institute, and Genome Quebec, is banding together to combat Porcine Epidemic Diarrhea (PEDV).

PEDV kills young piglets at an astonishing rate with a near 100 per cent mortality rate in suckling pigs. The research effort has been launched to understand and stop the disease, to protect the young pigs, and to aid the pork industry in North America.

PEDV first appeared in the United States in April 2013 and by January of 2014 it had appeared in Canada. At least eight million pigs have died since it was first discovered. More than 70 cases have been reported in Canada in PEI, Ontario, Quebec, and Manitoba.

Genome Alberta saw a way for genomics to be used to respond to the threat and put together a plan which included finding the necessary funding.

The contributors to the $650,000 funding envelope identified the value of genomics technology in dealing with the PEDV outbreak, launched the request for proposals, and assembled an international team of peer reviewers to recommend the projects to be funded.

Federal Government Announces Support for Food Safety Manufacturer

Left to right: Henry Liu, Technical Director, Gum Products International Inc.; Lois Brown, Member of Parliament for Newmarket-Aurora; The Honourable Gary Goodyear, Minister of State for the Federal Economic Development Agency for Southern Ontario (FedDev Ontario); and Kenneth Tan, Managing Director, Gum Products International Inc., at the funding announcement for Gum Products International Inc. Photo Credit: Tim Fraser

FedDev Ontario Minister of State Gary Goodyear and Newmarket-Aurora, ON, MP Lois Brown announced recently an investment of up to $995,000 for Gum Products International Inc. to expand its line of food safety products, introduce a new line of products and extend its global market reach in the food processing and biotechnology sectors.

FedDev Ontario's repayable contribution, through the Investing in Business Growth and Productivity initiative, is aimed at helping established businesses to expand operations, invest in productivity improvements and compete globally.

Gum Products International Inc. is a manufacturer of food additives for the food processing industry. The company plans to purchase new processing equipment to accommodate product expansion and introduce a new food safety product to target more food-borne pathogens.

One of the few experts in manufacturing food additives with natural ingredients, the investment will allow the company to make improvements to new technology, expand its global markets, and achieve its goal of transitioning from a food additive manufacturer to a biotechnology company.

the smoothie craze

HEALTHY, CONVENIENT AND PORTABLE, CONSUMERS ARE SLURPING MORE BLENDED DRINKS

Text by Hermione Wilson | Dr. Oz photo credits: Sony Pictures Television

Smoothies make breakfast fun again, says Dr. Mehmet Oz. The American cardiothoracic surgeon and television health guru has been promoting smoothies as part of his Oz Cleanse, which he developed with The Biggest Loser dietitian, Rachel Beller.

"All too often, we're skipping what truly is the most important meal of the day because we're rushing out the door," Oz says. "I like to throw all of my ingredients into the blender the night before and store it in the fridge. That way in the morning, I can just blend things up and head out the door."

It's no wonder then that when Canadians are looking for a healthy breakfast drink, they increasingly reach for a smoothie. When stopping to eat a sit-down breakfast meal is not in the cards, Canadians often opt to replace it with the blended beverage, according to consumer data from Ipsos Reid, an independent market research firm. "It meets a lot of needs," says Ipsos Reid vice president Kathy Perrotta.

Oz agrees. "Smoothies are a great, easy way to ensure you're getting fruits and vegetables into your diet," he says. "You're getting the vitamins, minerals, and antioxidants you need straight from the source."

Trending Now

"FRESH FRUITS AND NATURAL SWEETENERS LIKE HONEY, DATES, AND UNSWEETENED COCOA POWDER SATISFY MY SWEET TOOTH. A SPLASH OF UNSWEETENED COCONUT OR VANILLA ALMOND MILK IS ANOTHER GREAT WAY TO SWEETEN THE DEAL."
– Dr. Oz

The Oz Cleanse is filled with all sorts of creative smoothie alternatives to traditional breakfast meals. Instead of the scrambled eggs with sliced fruit, Oz suggests making an A.M. Citrus Body Fuel by blending a banana, an orange and some protein powder. Instead of enjoying steel-cut oats with apples and almonds, Oz takes those same apples and almonds and blends them into the Apple-Almond Super Juice.

There seems to be no limit to what goes into a smoothie or how much. It all depends on the consumer's taste preferences and what happens to be in their fridge at the time. All the possible eclectic mixes of fruits and vegetables make smoothies hard to pin down, but Oz says that, as long as you avoid "sugary add-ins and fatty fillers," the sky is the limit.

"When it comes to ingredients, it's all about quality, not quantity," he says. "My green drink [see recipe on next page] packs in several servings of both fruits and vegetables, and in general, you'll likely be able to blend up at least three cups of fruits and veggies before the blender starts to overflow."

The reasons trailing millennials give for drinking smoothies are very revealing about the motivations behind their consumption habits. They are concerned about health and fitness, and try to avoid artificial ingredients, but at the same time, they want to drink beverages that taste good.

ON THE GO

In Canada, smoothies seem to be most popular among the younger generation. Twenty-one per cent of smoothie drinkers are 18 to 24 years old, also known as trailing millennials, who also account for 11 per cent of all beverage consumption in Canada. "They drink more than their fair share of smoothies," says Perrotta. The reasons trailing millennials give for drinking smoothies are very revealing about the motivations behind their consumption habits. They are concerned about health and fitness, and try to avoid artificial ingredients, but at the same time, they want to drink beverages that taste good. The 18 to 24 set views smoothies as a sweet treat, a "reward," after a good workout.

Smoothie drinkers like that the drink not only tastes good, but is made with real fruit and that the sugar in it usually comes from a natural source. And of course, they love the convenience. "They can be consumed easily on the go, which is something that millennials embrace," Perrotta says. "They're portable."

READY-MADE OPTIONS

When consumers don't have the time or inclination to blend up their own smoothie creations, there is a wide selection of commercial brands available to slake their thirst. Grocery store shelves are stocked with brands like Oasis, Arthur's and Bolthouse Farms that offer consumers the ultimate convenience of pre-blended smoothie drinks.

Bolthouse, known for its health-conscious food products, offers a wide range of beverages, from organic carrot juice to protein drinks. It also sells a selection of 10 smoothies, which were launched in the U.S. in 2003 and in Canada soon after. The most popular flavour in Canada is Strawberry Banana, with the Green Goodness smoothie – an exotic blend of green tea, kiwi, spinach, barley grass, wheat grass, and Nova Scotia Dulse (that's a type of seaweed) – coming in second.

"We have a really, really smart group of experts at blending ingredients," says Brand Director AJ Bernstein. "They spend a long time developing each flavour and we do external sensory testing to make sure it meets our flavour standards."

Balancing taste with health concerns, Bolthouse avoids artificial sugars in its smoothies, says head of communications, Regan Phillips. "All of our smoothies, the sugar that you get from them is from the actual fruits and vegetables themselves," she says.

BUYER BEWARE

The popularity of smoothies among Canadians is a combination of convenience and taste, says Cara Rosenbloom, registered dietitian and founder of Words to Eat By, a nutrition education resource and communication company. "When you ask Canadians what is the most important thing when they're eating, taste is always paramount. Because smoothies taste good, because they're usually fruit-based and they have a sweetness to them, they're easy for people to accept."

But the amount of sugar in some smoothie brands can be a concern, Rosenbloom says. "You're thinking, 'Wow, I just drank all the fruits and vegetables I need for a day,'" she says. What many consumers don't know, she adds, is that some smoothies are made from fruit concentrate, which "doesn't count as a serving of fruit; it's just plain sugar."

Just because the sugar comes from fruit, Rosenbloom says, doesn't mean it's any healthier. There's a big difference between the 10 to 15 grams of sugar you get from eating a whole fruit and the 55 grams of sugar extracted from the same fruit to make a concentrate, she says, with the sugar content in some smoothie beverages comparable to what's in a soft drink. "Your body doesn't differentiate."

"A good smoothie doesn't need added sugar," Oz says. "Fresh fruits and natural sweeteners like honey, dates, and unsweetened cocoa powder satisfy my sweet tooth. A splash of unsweetened coconut or vanilla almond milk is another great way to sweeten the deal."

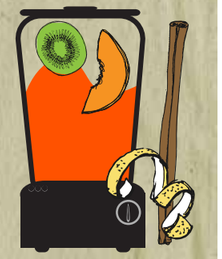
Smoothies are primarily consumed as a breakfast drink, often replacing the meal itself, according to the Ipsos Reid data. The problem is, they may not be as filling. Smoothies that are loaded with fruits but leave out protein may satisfy hunger in the moment, but have the same crash and burn effect of a sugary food or beverage. "You want there to be a source of protein," Rosenbloom says. "Protein helps keep you feeling a little bit more full and it blunts the effect of pure sugar going into your bloodstream."

Oz recommends, when using smoothies as a meal replacement, including ingredients that are high in protein and fiber, like chia seeds, nut butters and silken tofu. "A well-planned smoothie can replace a meal," he says. "You just need to be sure to include the right ingredients that will fill you up and keep you satisfied."

Check out Dr. Oz's **top tips** for fabulous smoothies

DR. OZ'S 4-part Smoothie

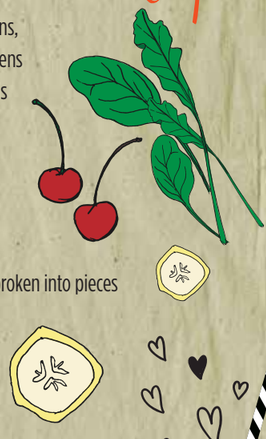
1) Start with the base: yogurt, silken tofu, some sort of low-fat liquid
2) Add your fruits and veggies
3) Give it a healthy protein boost with ingredients like chia seeds or nut butter
4) Sweeten and flavour your smoothie: cinnamon, ground ginger, lime zest, and honey are all great options



DR. OZ'S EASY BEING GREEN Smoothie Recipe

INGREDIENTS

4 cups of your favourite leafy greens, such as kale, spinach, collard greens
2 tbsp hempseeds and/or flaxseeds
1 cup frozen blueberries
1/4 cup frozen cherries
1/4 cup frozen raspberries
1/4 cup frozen pineapple pieces
1/4 cup frozen mango chunks
1 medium frozen peeled banana, broken into pieces
2 cups unsweetened almond milk



DIRECTIONS

1) In a high-powered blender, combine greens, hempseeds, blueberries, cherries, raspberries, pineapple, mango, banana and almond milk.
2) Blend on high speed for 60 seconds or until smooth. Enjoy icy cold.

CANADIANS LOOK TO PLANT WATERS FOR HEALTHIER HYDRATION OPTIONS

Text by Suley Muratoglu

The benefits of coconut water have quickly catapulted the electrolyte-rich elixir from an exotic liquid sipped from the shell by locals and tourists to the epicentre of an entirely new beverage category: plant waters. And while coconut water consumption continues to grow and evolve in the natural beverage space, which intersects with the similarly expanding functional foods category, it now has lots of company.

In fact, the natural beverage category, which includes a number of 'functional foods,' is one of the fastest growing sectors in the beverage industry. As the vanguard plant water beverage, coconut water remains the leader in this category with sales of over $27 million from July 2013 to July 2014, according to a Tetra Pak-commissioned report.

Tom Zummo, CEO of Arizona-based True Me Brands, which makes True Nopal cactus water, chalks it up to the 'you are what you eat and drink' mentality. "Consumers are no longer just looking to just put empty calories into their bodies to fill them up and this philosophy is leading consumption habits back to nature." True Nopal should enter the Canadian market soon, according to a company spokesperson.

"Consumers are looking for healthier options," points out Caroline Cyr, spokeswoman for the Federation of Quebec Maple Syrup Producers. "They are looking for novelty and new beverages. They want to have an experience of drinking purer and more sustainable drinks... that help them connect to nature."

Lars Poulsen, CEO of Sealand Birk, which produces birch water, echoes this sentiment: "Canadians think closely about what they eat and drink. [They are] concerned about traceability, and want to know where what they eat and drink is coming from, and how it is made, and what is inside it."

COCONUT WATER LEADS THE PACK

Plant waters' growth is dominated by coconut water, but a sizable and quickly diversifying bevy of other entrants are knocking on the door. Right now, companies making birch, cactus, aloe, barley, maple and even watermelon water are looking to appeal to the healthy and low-calorie niche coconut water has carved out between sports drinks and pop. Imaginative new varieties are bubbling up the pipeline as quickly as entrepreneurs and established brands can formulate them.

This is in contrast to the experience of coconut water, which stood alone in the market as a plant water when it was introduced in North America in 1997, according to an internal report Tetra Pak commissioned in February 2014 from market-watcher Mintel. There is still no recognized plant waters category in marketing reports, but industry watchers expect that to change in the near future, especially with maple water swiftly making its way onto the scene.

PLANT WATER MARKET GROWS EXPONENTIALLY

This category has seen tremendous growth since inception – particularly in the past three years. In 2013 alone, according to the Mintel report, 264 variants of plant water were introduced (including different flavours from same brand), and there are currently 848 variants of plant waters sold worldwide, with 319 of those in North America.

"The plant water market keeps growing at the expense of soft drinks, and plant water [makers] are aiming to position themselves within this space by leveraging the equity of the word 'water,' while adding a natural element for functionality," explains Riccardo Vellani, Beverage Category Manager for Tetra Pak U.S. and Canada.

WHAT SETS PLANT WATERS APART

In terms of functionality and flavour, each type of plant water has a unique nutritional and taste profile, and its makers tout varied benefits for body or beauty. For instance, coconut water benefits include its rehydration; aloe water is seen as a beauty boon for skin; birch water is viewed as an overall health tonic; and maple

Right now, companies making birch, cactus, aloe, barley, maple and even watermelon water are looking to appeal to the healthy and low-calorie niche coconut water has carved out between sports drinks and pop.

In 2013 alone, according to the Mintel report,

264
variants of plant water were introduced (including different flavours from same brand), and there are currently

848
variants of plant waters sold worldwide, with

319
of those in North America

water is naturally very low calorie, containing over 46 essential nutrients, including minerals, peptides, amino and organic acids, and boasts a subtle flavour profile.

Also, some plant waters are made from sap (birch), some from juice (cactus) and others from pressed fruit (watermelon), which all have different properties and production requirements. For instance, coconut water begins breaking down quickly when exposed to sunlight, while maple water spoils quickly without the right preservation techniques. So as beverage makers look to enter or expand their presences in the plant water market and preserve the products' functional properties, packaging is an important consideration for them from product preservation and consumer-appeal perspectives.

IN TERMS OF FUNCTIONALITY AND FLAVOUR, **EACH TYPE OF PLANT WATER HAS A UNIQUE NUTRITIONAL AND TASTE PROFILE**, AND ITS MAKERS TOUT VARIED BENEFITS FOR BODY OR BEAUTY.

PACKAGING IS KEY TO FRESHNESS

Besides the production issues, the vast majority of coconut water now on the market is packaged in aseptic cartons for a variety of reasons. Aseptic UHT processing is gentler on the vitamins and minerals that plant water brands are selling, for example, and without refrigeration many plant waters would quickly deteriorate post-harvest without the protection of an aseptic carton.

"Cartons have become synonymous with coconut water," notes Jeff Rubenstein, Vita Coco Senior Vice President of Marketing, adding that consumers who seek out healthy beverages are the same ones who care about sustainability and recyclability. "We think Tetra Pak provides a certain halo benefit for our brand."

For the same reason, other plant waters are turning to aseptic cartons. Maple water has a long and storied history in Canada, where early settlers learned to tap maple trees for their sweet sap from the First Nations people. Yet only recently has it become commercially available. Since maple sap has a very short shelf life, usually spoiling after just a few days, until now, consumers needed to be geographically close to a maple grove to be able to taste fresh maple water.

However, after seven years of research and development, researchers at the Federation of Quebec Maple Syrup Producers, funded by grants from the Quebec provincial government and the Canadian government, developed a way to extend its lifespan, ensuring that it stayed fresh up to 18 months at room temperature. This was due in no small part to the advances in packaging and processing technology developed by Tetra Pak, notes Cyr. Launched in 2013, there are four brands of maple water on the market – Oviva, Seva, Maple3 and Wahta, with more on the way.

As beverage manufacturers begin to explore or expand their presences in the functional plant waters market, they should consider the role of packaging in the preservation and promotion of these ephemeral essences of nature. Tetra Pak's Product Development Center in Denton, Texas, makes it possible to process small batch test runs for these new products before scaling them up and shipping them out to consumers, who remain increasingly thirsty for waters that offer more flavour and functionality than what is currently on tap.

Suley Muratoglu, Vice President, Marketing & Product Management, Tetra Pak Inc. U.S. & Canada, currently runs the company's presence in core categories, including dairy, beverage and food. Further industry insights from him can be found at **www.doingwhatsgood.us**. Tetra Pak (tetrapakusa.com) is the world's leading food processing and packaging solutions company.

DAVE BENDER

Vice President of R&D for Griffith Laboratories Canada

Text by Theresa Rogers

A fluctuating Canadian dollar, increasing competition, clean label requirements, demographic shifts and more, there is no shortage of challenges for Canadian ingredient system suppliers these days. We spoke with Dave Bender, Vice President of R&D for Griffith Laboratories Canada, on how his company is leveraging teamwork, superior food science, and deeper insights to effectively respond to the ever-changing needs of the Canadian family.

What's the competitive environment like for food ingredient manufacturers right now?

The environment is extremely competitive. It has become a global marketplace where we have local, North American and worldwide competitors. When we go to market it's with a full solutions approach, and that's how we believe we can differentiate ourselves in the marketplace. When we do work on projects it is a multi-functional team including our chefs, our sensory scientists, and they will work hand-in-hand with our product developers and our innovation team to make sure we address the project need that our customers have.

> "THE ENVIRONMENT IS EXTREMELY COMPETITIVE. IT HAS BECOME A GLOBAL MARKETPLACE WHERE WE HAVE LOCAL, NORTH AMERICAN AND WORLDWIDE COMPETITORS."

Is it accurate to say there are a lot of competing challenges these days: clean labels, sourcing ingredients, changing demographics, etc.?

It certainly would be accurate. All of these challenges, including regulatory compliance, are key factors in our work. Our customers have specific requirements that are very unique and then beyond that, the products we develop have to taste great and deliver to all expectations. To the earlier point about the competitive environment, solutions also have to be cost-effective.

Has this been a gradual change?

In many regards, it has been gradual. The Canadian ingredient business has always been competitive but you could say everything has sped up over the last five years: the changing dollar, consolidation of the overall food industry, closing of food manufacturers across Canada; all of these have led to a more competitive environment. As a result, everyone has to be on their toes and I think the adjustment has been more dramatic the last five years with what we all need to do to ensure our business is healthy, sustainable and growing.

Is a high Canadian dollar or low Canadian dollar better for the food ingredient business?

The rate of change in the dollar can be challenging for sure. It really depends on your product mix and what you're selling. It can be good for exports but many ingredients are purchased in U.S. dollars and therefore input costs are driven up.

How do you identify food and flavour trends?

We have various ways. We spend a lot of time with our marketing team understanding what the key consumer trends are; whether it's specific flavours, types of cuisine, or a health and nutrition trend. We watch locally and globally all the retail and foodservice new product introductions. Our marketing team focuses on where the food consumer is going in the future. We then work to understand what people are looking for in regards to a flavour system, seasoning or textural attribute and then we execute so that we can deliver on what consumers will be looking for.

Explain your approach in terms of the go-to library versus new toolbox.

It's about customization. A company like ours has developed literally thousands of products which have been put into a product library over the years. In the past, that was a way of going to market where if a customer was simply looking for a chili seasoning, we would give them one of five in the library. Over the last 10 years but certainly increasingly, everyone wants to customize their offerings. They want their own spin on it whether it's asking for lower salt, a higher heat level, a twist on the chili seasoning or they're looking for a cleaner label for their customer. It almost seems that every opportunity that comes to us is now, 'Do you have this type of product, but now let's customize it,' and that's what we do extremely well.

WHAT'S HOT FOR BBQ SEASON?

How long does a trend typically last?

Great question. Depending on the trend, it can last six months to decades. We definitely try to take a look to see if it's a trend or a fad and at times it's as much our guess as anyone in the industry. We'll look at the trend and see where we can play and see if we can expand and do our part to increase the life of that trend. A trend can become mainstream. It's our goal when we launch products to make them taste great, deliver on all sensory attributes and meet all the customer requirements so that trend does eventually turn into mainstream. Part of our role is to make sure, as much as we can, that the trend has staying power.

What is going to be hot for the upcoming BBQ season?

From a flavour perspective, some of the platforms we see hitting the BBQ are the evolution of hot and spicy, tangy and sour, and sweet and salty flavour profiles. And especially for summer, fruity and floral. Pomegranate, mango, citrus-lime, and pear flavour systems may be visiting a BBQ near you soon.

There is a lot of market research available to categorize customers and slice and dice. Does that make your job both easier and more difficult?

Yes, it can make it easier and more difficult, and you have different types of retailers and food service channels catering to more niche markets. There's also regionalization. Now, consumers are looking for regional cuisine whether it's the west coast, Quebec, Ontario, or the east coast, so you have to have an understanding of what it means to each marketplace and why it might work.

It must be interesting to see how things do or don't come together and the expertise involved in mixing these foods, technologies and flavours.

You're absolutely right and it's to the point of this article. Consumers are asking for new and innovative. How they're cooking, whether it's with smokers, on the BBQ, indoor grills, a wood-fired oven for a pizza place; each one of those characteristics can affect how we develop the products. For example, you may want a product to withstand a certain temperature and if it's on the BBQ grill you're concerned about flame-up versus an oven recon. It is all of those aspects that we have to take into consideration when we're developing the product.

We've seen recent trends with ingredient concerns: probiotics, gluten, salt, sugar. We know the government is introducing new labeling requirements. What are people looking at removing from food next?

The movement toward cleaner labels, and that means so many different things to so many customers, is having an effect. I hope the key is trying to be as consumer-friendly as possible by providing the correct information. Sometimes that can be a challenge because consumers don't always know the information they are looking for or the importance of certain attributes of the nutritional label they should be looking at... We need calories, we need some fat, and we need some carbs, so for us it's about finding that balance. Moderation is so important and finding the right balance is what's critical.

Is it easier to remove something or add something?

Both can be challenging. Generally, it's much easier to develop from scratch when we know what a customer is looking for. Adding or subtracting can be equally challenging but the addition or removal of one extra ingredient, especially on the flavour side, can throw that balance right off.

What's in the future?

Just looking at the positive side, some of these challenges that we discussed can sound overburdening but that is what makes the product development business so exciting. They are challenges but most of them can be overcome. We learn from each and every project and as a result we're making a lot of advancements in the food industry. These challenges push us to innovate and move in a positive direction and meet the ever-changing consumer needs. The food industry is able to rise to these challenges.

One other aspect is that for an ingredient supplier like us, we rely on our suppliers, industry groups and academia to help solve some of these challenges. I think if there's a movement in the industry going forward, it will be about collaboration and all of us working together.

Collaboration while maintaining trade secrets!

Absolutely. We are up against certain dynamics, especially for food manufacturing in Canada where it might be time where we have to do even more collaboration to ensure we continue to be successful in the global market and that will include the educational and industry partners that are part of the food processing industry.

THE RIGHT MIX

INGREDIENT SUPPLIERS EVOLVE THEIR APPROACH, CREATING THE PERFECT MIX OF FLAVOURS FOR THE CANADIAN CONSUMER

Text by Jennifer Neate

With the BBQ season just around the corner, retailers and foodservice operators are gearing up to entice Canadians with new menu offerings as they fire up the backyard grill and celebrate summer on the restaurant patio. As seasons change and the next generation of food products are introduced, Canadian ingredient suppliers are hard at work behind the scenes, creating the perfect mix of flavours and working with processors through the development process to commercialization. This next culinary season is, like every other before it, uniquely challenging. Driven by the ever-changing needs and tastes of the Canadian consumer, food ingredient suppliers must constantly evolve their approach to stay ahead of the curve.

"Griffith has been developing and manufacturing food ingredient systems since 1929 in Canada, but unlike the past, we can no longer rely on using a standard library of existing products," says Dave Bender, Vice President R&D at Griffith Laboratories. "We have built our business based on our ability to deliver signature formulations for each customer, incorporating innovation in flavour, texture and functionality. That requires a focus on deeper consumer insights, long-term research, and a unique approach for every opportunity."

Ingredient system suppliers like Griffith have become an extension of their foodservice, retail and processor customers' marketing, development, culinary and regulatory teams. In an extensively collaborative process, they provide market insights and develop customized culinary concepts, then draw from the expertise of internal cross-functional teams to put together combinations of label-friendly ingredients that deliver on flavour, functionality, nutrition requirements, all at an acceptable price point. Meeting the mark can be a huge challenge, and gets more difficult as Canadian consumers continue to hunger for more.

CHOOSING THE FLAVOURS THAT FIT

Development of successful menu or retail concepts depends on delivery of the right balance of flavour excitement and mainstream appeal. Canadian food companies face a big challenge in deciphering when a flavour trend has real longevity or when the interest will be short-lived. The key to this is selecting flavours in the right stage of penetration in the market, and the correct stage also varies based on the positioning and target consumer of the brand, retail or foodservice.

"At Griffith Laboratories, we believe that every brand has the opportunity to participate in key trend platforms that are in the peak of popularity," says Bender. "The trick is selecting the right flavours within those broad trend platforms, e.g. selection of a chicken wing sauce featuring sriracha versus a buffalo sauce, both within the broad platform of hot and spicy flavours. The right choice in this case would depend on the customer/guest profile of the particular foodservice operator or retail processor we are working with."

This approach speaks to the much-needed focus on customized development, and to the end of a go-to list of library products that the chef and scientist can select from. Increasingly, food ingredient suppliers are launching new programs that demonstrate capabilities and innovation, more of a "toolbox" approach, and not a portfolio of final sauce and seasoning product codes. These programs serve as a foot-in-the-door, but then the teams proceed with collaborative development of signature formulations.

FORMULATING "THE COMPLETE PACKAGE"

Once the question of flavour is addressed using insights and careful consideration, concept development can begin. A next challenge for the ingredient team to address can be delivering on consumer requirements that can be contradictory by design, such as low sodium with bold flavour, or optimum performance at a lower cost. Interest in products with health and wellness cues continues to grow, however Canadian food ingredient manufacturers are faced with changing definitions of "healthy" in an evolving regulatory environment, and at the same time, must ensure stability and safety of food products. Consumers are better informed, demanding more, but compromising less. Canadian Millennials are seeking out intriguing global flavours and high-quality food offerings, but also crave value.

"Our developers are constantly working with evolving targets as they execute projects for our customers," says Bender. "A few years ago, sodium was the enemy. Now, consumers are becoming increasingly concerned, and aware of, sugar. It's important that our teams stay ahead of the market demands. "

Project execution to balance these equally important criteria for success now requires a multi-functional team approach. Ingredient system project teams now include chefs, sensory scientists, and regulatory specialists working in collaboration with the product

THE TRICK IS SELECTING THE RIGHT FLAVOUR

developer. The team brings the concept from gold standard to commercialization.

To hit the targets, ingredient system suppliers must rely on creative solutions and innovation. Companies like Griffith Laboratories have established teams focused on longer-term research in order to stay ahead of the curve. Often this means partnerships to leverage external resources around the world, such as academia, industry associations and suppliers.

DELIVERING EFFICIENT CUSTOMIZATION

Canada is one of the most multicultural countries in the world and catering to diverse tastes and needs is becoming a big part of survival in an increasingly competitive environment. In addition, generational differences are driving very distinct preferences when it comes to food. Canadian ingredient system suppliers are challenged to keep up with the demand for customized products (e.g. "customized nutrition"), customer-specific or even exclusive product offerings and innovation, and increasing limited time offerings. The one-size-fits-all approach is no longer viable.

The foodservice industry is seeing increasing specialization of menus in recognition of regional differences, which is a tall order when considering the immense landmass for distribution. With regional foodservice menus on the rise and limited time offers increasingly leveraged as a way to drive excitement and increased traffic, suppliers are searching for ways to efficiently deliver to diverse requirements.

The answer may lie in creative solutions and a focus on operational flexibility. Ingredient suppliers must remain nimble and employ capabilities to effectively manufacture in smaller batch sizes to allow for customization and efficiencies for limited time offers. Development teams are taking a new approach by formulating base ingredient systems with complementary building blocks or "flavour keys" to allow for manufacturing efficiencies and easy customization at the processor or restaurant level.

FUTURE ADAPTATIONS

As food companies face more competitive pressure in the coming years and strive to remain relevant to the Canadian consumer, ingredient suppliers will be challenged with even further complexity. Consumers will continue to become better informed and opinionated on the desired attributes of their food choices. Definitions of better-for-you and better-for-the-planet will continue to evolve, and there will be more focus at every level of the food chain on sustainability, bringing a heightened degree of complexity to the sourcing of ingredients and catalyzing much needed reform throughout the industry in Canada. The key to success will be establishing the right teams and processes to better understand the changing market and find creative solutions without compromise to taste, performance, and nutrition.

Jennifer Neate is Director of Marketing for Griffith Laboratories Canada and can be reached at jneate@griffithlaboratories.com.

Paying Homage to the Clean Label – The Biggest Food Trend of 2015

Sara Zborovski

Welcome to the first Regulatory Arena of 2015: the Year of the Clean Label! The clean label has been identified as one of the key trends of 2015, and in recognition of the importance of the clean label to Canadian consumers and industry, we will be devoting all four 2015 editions of the Regulatory Arena to the clean label.

In this first instalment of our four-part series, we will define the "clean label" and set the stage for the upcoming discussions. Our Spring/Summer edition will look at the treatment of the clean label in Canada as compared to the United States. In our Fall edition, we will dig into some "hot topics" in clean labeling: GMO-free, all natural, and the ingredients that Canadian consumers want to see the most (and the least) of. Finally, in the Winter edition, we will look more closely at the risks to industry linked to the clean label, particularly around compliance and enforcement by the CFIA. Of course, throughout the year we will also keep you posted on the latest developments in Health Canada's modernization makeover, particularly as it relates to labelling.

The seemingly enormous market demand for clean labels in a number of global regions shows no sign of abating. The questions for industry: what is a "clean label" and should I (and if so, how can I) capitalize on the trend. But first, what is a clean label?

DEFINING "CLEAN" LABEL

The concept of clean labeling has been gradually building over the last few decades. So-called clean labels were essentially non-existent prior the early 2000s but since then, clean-label product launches have been growing steadily to a rate of more than 4,000 a year. The movement is a global phenomenon, with enormous popularity in Europe and increasing popularity in North America and Asia.

As with many trends in the food industry, this one is very much consumer-driven. However, despite all the hype that the clean label is getting, there is no real consensus on what a clean label is, with the term still meaning different things to different people. Over here in the Regulatory Arena, we see two primary elements to the clean label trend: the push toward increased transparency in labeling, and the use of ingredients with perceived benefits.

TRANSPARENCY

As we have discussed in a number of past columns, the push for increased transparency is a hot topic in general, and is a key driver of Health Canada's modernization makeover. Health Canada defines transparency as "making relevant, timely and useful information available to the public in easy to access formats" in order to "strengthen [Canadians'] trust in [Health Canada's] regulatory decisions" and help "Canadians take action on their health and safety."

Similar themes apply to the demand for clean labels: those pushing industry for clean labels are essentially asking for more accessible information about what is in food, in order for them to make informed choices for themselves and their families.

In order to make food labels more understandable (i.e. transparent), industry is being driven to avoid extensive ingredient lists full of chemicals, and other hard-to-pronounce ingredients. The clean label consumer is put off by extensive ingredient lists full of foods she/he doesn't recognize and can't pronounce. There is a perception that the shorter the ingredient list, the less there is to hide.

"CLEAN" INGREDIENTS

The second element of the clean label trend is tied to the perceived benefits of certain types of ingredients. In addition to wanting short, clean ingredients lists, clean label advocates want industry to use certain types of ingredients. In this way, the clean label trend is linked to other hot food trends, like the push toward GMO-free, organic and all natural ingredients.

According to the 2013 Gallup Study of Clean Food & Beverage Labels, today's clean label consumers are particularly interested in products that are "all natural," contain recognizable ingredients, with no artificial ingredients, no added sugar, no high fructose corn syrup, and no MSG.

THE IMPACT ON INDUSTRY

As with many food trends, the push for clean labels is pressuring many in industry to reformulate and repackage in order to meet consumer demands. Seemingly offensive additives and ingredients are being removed and "clean" ingredients are being sourced. Manufacturing facilities are also becoming "clean" as dedicated organic, allergen-free and non-GMO lines are introduced. Labels are being rewritten in plain, simple language.

In some cases, the clean label trend can be a great benefit to manufacturers as simplified ingredients can reduce operating costs with fewer raw material SKUs and result in export-friendly foods and formulas. However, others in industry are approaching the clean label trend with a little more caution. It is no secret that the cost of following food trends can be substantial, with little or no guarantee of how long the trend will last.

The clean label trend speaks volumes to the higher standard to which consumers are now holding industry. Today's consumer is more educated and is making more informed decisions about the food they buy, and they are demanding that industry provide them with the tools needed to make informed decisions. Regardless of your views on food trends in general, it is difficult to imagine the Canadian consumer becoming less interested in what is in his/her food anytime in the near future. And so at a minimum, the next three instalments of the Regulatory Arena will focus on how industry can provide Canadians with this much sought-after information in the context of the clean label.

The Impact of Salt Reduction in Baked Goods

Aleksandar Yovchev[1] | Martin Scanlon[2] | Michael Nickerson[1*]

Dietary intake of sodium chloride (NaCl, commonly known as salt) has increased considerably over the last few decades due to changes in the human diet. The main source of NaCl in our diet is processed foods, accounting for ~70-75% of the total intake, with cereal and cereal products contributing 30-35% of overall intake.[1,2] It has been widely reported that high daily NaCl intake results in hypertension as well as numerous cardio-vascular diseases and other health problems.[3,4] This results in a serious strain on health systems which can have a negative impact on society. Cardiovascular disease (apoplexy, heart attack, heart failure) as a result of hypertension is thought to be the most common cause of death in industrial countries.[5] Because cereal foods comprise a significant amount of our diet, yeast-leavened products are a major source of dietary sodium; therefore there is significant consumer and government demand on the baking industry to explore ways to reduce sodium in its products. The importance of such reduction has been highlighted by legislations introduced by the European Union[6], Canada[7], and the United States[8]. The World Health Organization (WHO)[9] has set a target of a 30% relative reduction in population NaCl intake for all member countries of the United Nations by 2025. Baked goods, and in particular bread, are considered as a key target in salt-reduction strategies.[10] As part of Health Canada's Sodium Working Group strategy, targeted sodium levels in pan bread should reach ~330 mg/100g by 2016. For the strategy to be successful, partnerships between the responsible organizations from industry, various government agencies, and research institutions would be required.

IMPACT ON PROTEIN FUNCTIONALITY AND DOUGH QUALITY

Concerning cereal proteins, the unique capability of wheat gluten to build up a network structure is well known. Gluten proteins have been divided into roughly equal fractions according to their solubility in alcohol-water solutions of gluten (e.g. 60% ethanol): the soluble gliadins and the insoluble glutenins. The appearance of wheat dough viscoelastic properties is largely attributable to the functionality of gluten molecules. It is widely accepted that glutenin contributes mainly to gluten's elastic properties while gliadin contributes primarily to its flow properties. Wheat dough is generally regarded as a complex material composed of a hydrated protein network in which starch granules and insoluble flour particles are dispersed. Cysteine belongs to the minor amino acids of gluten proteins (~2%), but it is extremely important for the structure and functionality of gluten.[11] Most cysteines are present in an oxidized state and form either intrachain disulphide bonds within a protein or interchain disulphide bonds between proteins. These bonds are the main target for most redox reactions that occur during dough preparation and baking.[12] Additional covalent bonds formed are tyrosine-tyrosine crosslinks between gluten proteins[13] and tyrosine-dehydroferulic acid crosslinks between gluten proteins and arabinoxylans.[14] The incorporation of NaCl increases the ordering of the water structure, and also aids in the exposure of apolar groups on protein to the solvent, and thus allows proteins to interact with each other through hydrophobic interactions.[15,16] The hydrophobic interactions between gluten proteins play an important role in stabilizing gluten.[17] Reduction of NaCl causes a weakening of the dough and an increase in water mobility within the dough matrix, resulting in sticky dough.

Stickiness is a surface-related property related to both adhesive and cohesive forces. Dough with a weaker gluten network tends to have high and low adhesive and cohesive forces, respectively, leading to the stickiness phenomenon.[18,19] In contrast, dough with a well-developed gluten network displays low and high adhesive and cohesive forces, respectively, enabling it to be processed well. Dough stickiness is the major limiting factor of NaCl reduction as it relates to the baking industry. In manufacturing, stickiness can lead to low product yield, operational issues, equipment wear and fire hazards.[18,20]

Reviews

Whilst dough can often be well-handled and successfully baked on a small scale, production of low-salt baked goods on a big industrialized scale requires precise description of the rheological changes in dough to secure good machinability and proper handling.

IMPACT ON QUALITY CHARACTERISTICS OF THE FINAL PRODUCT

A wide variety of baked goods can be found on the supermarket shelves, such as breads, unsweetened rolls and buns, dessert pies, pizza, crackers, cookies, and others. Based on the method of leavening, baked goods can be classified as biologically (yeast) leavened, chemically leavened or unleavened. NaCl as an ingredient in dough formulations has a significant impact on the final quality of yeast leavened products, in particular bread. In bread making, the fermentation is the second important stage, after dough mixing. Dough passes through several stages of fermentation. The role of NaCl in controlling the fermentation is not only due to the increase in osmotic pressure, but also to specific actions of sodium and chloride on the semipermeable membranes of the yeast cells.[21] A reduction in NaCl level causes an increased yeast activity and higher CO^2 production. As the gluten network becomes weaker at reduced level of NaCl, dough has trouble entrapping the higher amounts of CO^2, which negatively affects the bubble distribution within the crumb and leads to a greater level of collapse and defects in the final product.[2]

The baking process is the final stage, where the relatively high temperatures result in a profound change in taste, flavour, and texture in the dough. During baking a number of physical changes occur, including the rapid expansion of CO^2 and water vapor as well as starch gelatinization and protein denaturation.[22] These phenomena play a key role in the formation of the two sections of bread, the crust and crumb. Crumb formation involves the change of the gas fraction in dough, which is a disperse phase like foam, into a sponge structure where the gas cells are interconnected. At the beginning of baking the temperature rises up to about 100°C and is maintained there as long as the outer layer contains free moisture. The moisture evaporates or diffuses to the enterior.[22] As soon as the temperature rises above 110°C processes such as nonenzymatic browning (known as *Maillard reaction*) begin. The reduction of NaCl influences the crust flavour and colour due to the impact on yeast activity. Increasing yeast activity leads to a reduction in the amount of free reducing sugars remaining for these processes. The melanoidins formed by the *Maillard reaction* contribute essentially to the flavour composition of baked goods. Moreover, clinical biochemical studies have recently shown that these browning products partly exhibit antimutagenic and anticarcinogenic properties.[23] Most of the odorants which produce the aroma profile originate from the crust. The light crust of NaCl reduced bread is caused by a lack of melanoidins. The contribution of crust to the whole flavour composition of bread is reduced and the bread tastes insipid and stale.[24] A descriptive sensory evaluation showed that bread without NaCl lies in the area of sensorial space described by "sour/acidic", "sourdough" and "yeasty" flavour attributes[2], thus making it unappealing to consumers.

IMPACT ON SHELF LIFE

Baked goods, except cookies and crackers, belong to the group of intermediate moisture (having water activity $0.6 < aw < 0.85$) and high moisture baked products ($aw > 0.85$).[25] While physical and chemical spoilage problems limit the shelf life of low and intermediate moisture baked products, microbiological spoilage is the main concern of intermediate and high moisture products. In intermediate moisture products, osmophilic yeasts and molds are the predominant spoilage microorganisms, whereas in high moisture products, almost all bacteria, yeasts, and molds are capable of growth.[26] NaCl acts as a preservative agent, due to its ability to reduce the water activity. The increased osmotic pressure causes cells to loose water to the environment, thus inhibiting cell metabolism and inhibiting microbial growth.[27] Furthermore, sodium ions and chloride ions can promote specific changes in metabolisms inside the cells.[21]

The main source of NaCl in our diet is processed foods, accounting for ~ ***70-75%*** *of the total intake.*

As part of Health Canada's Working Group strategy, targeted sodium levels in pan bread should reach ~ ***330 mg/100g*** *by 2016.*

STRATEGIES FOR LIMITING THE IMPACT OF NACL REDUCTION

A number of strategies have been employed in the literature to help circumvent technological issues associated with dough handling and bread quality at reduced NaCl levels. For instance, enzymes (glucose oxidase, xylanase and alpha-amylase) or enzyme mixtures have been used to target proteins, starches, and/or pentosans in order to alter the dough's viscoelastic properties and improve handling of sticky dough.[28,29,30] Biopreservatives (e.g., lactic acid bacteria which produce organic acids such as lactic, acetic and propionic acids after fermentation) or chemical preservatives (potassium sorbate/ethanol, calcium propionate/ethanol or acetates) have been used as a means to improve shelf life through pH reduction, as an alternative preservative to NaCl.[25,31] Furthermore, improved packaging, such as modified atmosphere packing, active packaging, or packaging with new and improved polymeric materials can be used to extend the shelf life of bread products which have reduced levels of NaCl.[25,32] Taste contrast has also been used as a sensory technique to alter saltiness by creating a heterogeneous distribution of NaCl within the bread product, to give the same salt perception but with an overall reduced salt level.[33] However, probably the most work associated with salt reduction are focused on the use of alternatives to NaCl, such as potassium, calcium and magnesium chloride in order to maintain dough/bread quality. Potassium chloride has been found to act best to partially replace 25-50% of the NaCl concentration to give good dough handling, however metallic or bitter flavors arise with 10-20% NaCl replacement rendering the product unacceptable to consumers and the strategy ineffective at reaching Health Canada targets.[34,35]

SUMMARY

Although numerous strategies have been developed to combat the effects of NaCl reduction in bread, no one approach has shown sufficient promise to meet Health Canada's targets put forth by the Sodium Working Group. As such significant research efforts in this area through collaborative university-industry partnerships is warranted in order to improve the health and wellbeing of Canadians and to ensure the Canadian bakery industry remains competitive in the global marketplace.

[1]Department of Food and Bioproduct Sciences, University of Saskatchewan, Saskatoon, SK
[2]Department of Food Science, University of Manitoba, Winnipeg, MB

*(*Corresponding author email: michael.nickerson@usask.ca)*

References
[1] Kilcast, D. & Angus, F. (2007) Reducing Salt in Foods: Practical Strategies (1st Ed.). Woodhead Publishing, Cambridge, UK.
[2] Lynch, E. et al. (2009) *Food Res Int* 42:885.
[3] Elliott, P. et al. (1996) *BMJ*, 312(7041):1249.
[4] du Cailar, G. et al. (2002) *Am Hypertens* 15(3):222.
[5] Lewington, S. et al. (2002) *Lancet* 22:1903.
[6] European Parliament and of the Council of the EU. EU, Regulation (EC) No 1924/2006 Regulation on nutrition and health claims made on foods.
[7] Canadian Food Inspection Agency, Canada (2008). Nutrient Content Claim, Guide to Food Labelling and Advertising, Chapter 7.21.
[8] Food and Drug Administration (FDA). USA, Code of Federal Regulations-Title 21: Food and Drugs (2005). Nutrient content claims for the sodium content of foods.
[9] World Health Organization (WHO). A comprehensive global monitoring framework including indicators and a set of voluntary global targets for the prevention and control of noncommunicable diseases. Second WHO discussion paper. Geneva, Switzerland: WHO Press; 2012. http://www.who.int/nmh/events/2012/discussion_paper2_20120322.pdf (accessed Sept 2014).
[10] Quilez, J. & Salas-Salvado, J. (2012) *Nutr Rev* 70(11):666.
[11] Grosch, W. & Wieser, H. (1999). *J Cereal Sci* 29:1.
[12] Wieser, H. (2003) The use of redox agents. In: Cauvain, S.P. (Ed.), Bread Making-Improving Quality. Woodhead Publishing Ltd., Cambridge, pp. 424-446.
[13] Tilley, K. et al. (2001) *J Agric Food Chem* 49:2627.
[14] Piber, M. & Koehler, P. (2005) *J Agric Food Chem* 53:5276.
[15] Preston, K. (1989) *Cereal Chem.* 66:144.
[16] He, H. et al. (1992) *Cereal Chem.* 69:366.
[17] Wieser, H. (2007) *Food Microbiology*, 24:115.
[18] Huang, W. & Hoseney, R. (1999). *Cereal Chem* 76:276.
[19] van Velzen, E. et al. (2003) *Cereal Chem* 80:378.
[20] Adhikari, B. et al. (2001) *Int J Food Properties* 4:1.
[21] Hutton, T. (2002) *British Food J*, 104:126.
[22] Sluimer, P. (2005). *Principles of Bread making: Functionality of Raw Materials and Process Steps*, 1st Ed. AACC, St. Paul, Minnesota.
[23] Belitz, H. et al. (2009) *Food Chemistry*, 4th Ed. Springer-Verlag, Germany.
[24] Belitz, H. et al. (2008) *Lehrbuch der Lebensmittelchemie*, 6th Ed. Springer-Verlag, Germany.
[25] Smith, J. et al. (2004) *Crit Rev Food Sci Nutr* 44 (1):19.
[26] Smith, J. (1992) Bakery products. In, *Principles and Applications of Modified Atmosphere Packaging of Food*. Blackie Academic and Professional, London.
[27] Yigit, A. & Korukluoglu, M. (2007) Ann. Microbiol 57(2):209.
[28] Basman, A. et al. (2002) *Eur Food Res Technol* 215:419.
[29] Tseng, C. & Lai, H-M. (2002) *J Food Sci: Food Eng Phys Prop* 67:750.
[30] Caballero, P. et al. (2005) *J Cereal Sci* 42:93.
[31] Crowley, S. et al. (2013) *Food Sci Technol* 33:93.
[32] Lataou, E. et al. (2010) *J Cereal Sci* 52:457.
[33] Konitzer, K (2013) *J Agric Food Chem* 61:10649
[34] Miller, R.A. & Hoseney, R.C. (2008) *Cereal Food World* 53:4
[35] Belz, M.C.N el al. (2012) *Crit Rev Food Sci* 52:514

REVIEWS

Maintaining Gut Health with Probiotics

Natallia V. Varankovich | Michael T. Nickerson | Darren R. Korber*

The microbiota of the human gastrointestinal tract (GIT) is extremely complex, consisting of bacteria, archaea, some protozoa, anaerobic fungi and different bacteriophages and viruses, with more than 1,000 species and up to 5×10^{11} (100 billion) bacterial cells per gram of intestinal contents[1]. According to American Society for Microbiology (2008), bacteria living on and within our bodies outnumber human cells by a factor of 10. Surely, such an enormous number of microorganisms would be expected to have a major impact on the functioning of the human organism. In fact, clinical studies have shown that the human microbiota play a variety of key roles, ranging from anti-pathogen protection, digestion of essential nutrients and immune-system training to affecting our weight and mood.[2-4] Furthermore, experiments on germ-free mice have shown that microbiota-negative mice are unable to maintain a normally functioning intestinal epithelium, effective nutrient digestion, or a normal level of immunological activity.[5] Hence, without indigenous microorganisms, a number of bodily functions would be impacted, including the ability to provide sufficient protection from pathogens.

Our way of life, and especially our dietary habits, has a major impact on the composition of the GIT microbiota. Factors such as antibiotic therapy, increased amount of sugar and fat consumption and contamination of food by pathogens bring considerable alterations to the gut microbial balance, generally causing infections or even more serious disorders, such as acute gastroenteritis or irritable bowel syndrome.[6] Antibiotic therapy is usually used to treat GIT disorders; however, the search for more natural and less intrusive alternatives is ongoing. This article reviews some of the potential health benefits of probiotics, along with the challenges industry faces in terms of processing and efficacy surrounding some probiotic health claims.

PROBIOTICS AND THEIR HEALTH BENEFITS

One of the most promising directions of human microbiota research which targets a number of aspects of human health is the applied use of probiotics – bacterial supplements that have beneficial effects on gut microbiota. The Food and Agriculture and World Health Organizations (FAO and WHO) define probiotics as "live microorganisms which when administered in adequate amounts confer a health benefit on the host".[7] Probiotic benefits are usually species – and even strain-specific and include, but are not limited to, inhibiting the growth and spread of pathogens in the GIT, stimulating the immune response towards pathogens and producing antimicrobial factors.[8,9] The popularity of probiotics has dramatically increased in recent years as has the public's general interest in healthier diets and lifestyles, functional foods and food supplements. However, it's not just advertising that has shifted consumer behaviour – the scientific community worldwide has invested considerable amounts of time and funds in finding a reliable and "natural" medication for gut disorders. A literature survey for publications featuring the keyword 'probiotic' in the NIH PubMed database reveals an exponential growth in probiotic research: only 173 articles were published from 1990 to 2000, whereas this amount increased by more than ten times (1916) over the next decade. In the following 5 years (from 2010 to January 15th, 2015), 1,434 probiotics articles were published, with 10 of them being released in the first 2 weeks of 2015.

The expanding field of probiotic research includes studies of many bacterial and several yeast species, each possessing potential beneficial properties. However, the majority of published papers in this area focus on the two most popular probiotic genera – Lactobacilli and Bifidobacteria. Lactobacilli or Lactic acid bacteria are Gram-positive, non-spore forming cocci, coccobacilli or rods, which ferment glucose primarily to lactic acid, grow anaerobically, but can tolerate the presence of O2. Unlike Bifidobacteria, which are mostly present in lower parts of the colon, Lactobacilli can be found in the upper GIT. They are also part of the normal human microflora of the oral cavity, the small intestine and the vaginal epithelium, where they are thought to play beneficial roles. In the human GIT, Lactobacilli improve digestion, absorption and availability of nutrients, influence energy homeostasis, particularly in obese patients, and produce B-group vitamins.[10] It has also been shown that Lactobacilli can inhibit or kill *Helicobacter pylori*, a major causative agent of gastritis and peptic ulcers.[11] The most famous species of the genus are *Lactobacillus acidophilus* and *Lactobacillus rhamnosus* GG due to their declared beneficial properties and wide use in probiotic products.

The second major group of potential probiotics are Bifidobacteria, also widely present in human GIT microbiota. They are Gram-positive, non-motile, often-branched anaerobes, producing acetic and lactic acids. In the human gut, Bifidobacteria are involved in the utilization of complex carbohydrates such as plant-derived dietary fibre that cannot be digested solely by human-derived enzymes or processes. Bifidobacterial strains have also proven to be effective in the prevention or alleviation of infectious diarrhoea and the improvement of inflammatory bowel disease symptoms.[12] Well-known species of this genus, widely-used as probiotic supplements, include *Bifidobacterium bifidum, Bifidobacterium animalis* and *Bifidobacterium longum.*

Though Bifidobacteria and Lactobacilli are the most popular subjects of probiotic research, other genera of bacteria and yeasts, such as *Saccharomyces spp.*, *Bacillus spp.* and *Streptococcus spp.*, have also been studied for probiotic potential.

CHALLENGES FOR PROBIOTICS IN THE FOOD INDUSTRY

In 2002, a joint FAO/WHO working group elaborated a list of specific requirements that have to be met in order to grant a strain a "probiotic" status.[13] These guidelines include:

i. complete identification of the strain (genus, species, strain);
ii. *in vitro* tests on probiotic potential (e.g. resistance to low pH, bile salts, digestive enzymes);
iii. safety assessment: the final product has to be safe for human consumption and not contaminated with other microorganisms; and
iv. *in vivo* studies on both animal models and human clinical trials, wherein health benefits are proven.

Most strains with probiotic properties are isolated from healthy human gut microbiota or food products, such as milk, which potentially makes them safe for use as food supplements. However, each strain has to be tested individually, even if it belongs to a species that is 'Generally Recognised as Safe' before it can be used in an actual functional food product or medication. Additional requirements include determination of antibiotic resistance patterns and possible side-effects during human studies.[13] The last requirement from the list (demonstration of *in vivo* efficacy) above is usually the most challenging for most potential probiotics, since most of them are sensitive to handling during manufacturing (especially anaerobes) and, when consumed, to the harsh conditions of the stomach, such as low pH and pepsin treatment. A probiotic product must contain at least $10^6 – 10^7$ viable bacterial cells per gram, where upon continued consumption, the probiotics are able to exert beneficial effects on human health.[13] However, delivering such high numbers of viable cells is rarely the case. Probiotic products, such as milk and yogurts, usually do not to meet this requirement, and consequently may fail to elicit the desired health benefits in the host. It is therefore desirable to use techniques to protect the probiotic-containing food product so that the numbers of viable bacteria remain high until they reach the colon where they may provide a functional effect or benefit.

PROTECTION OF PROBIOTICS DURING STORAGE AND PASSAGE THROUGH THE UPPER GASTROINTESTINAL TRACT

In general, probiotic bacteria that are administered as a food supplement are in a dried or freeze-dried form, which improves preservation and extend shelf-life. However, this approach leaves bacteria unprotected from the highly-acidic conditions of the stomach. Alternatively, encapsulation technology has been shown to help circumvent this issue by coating the probiotics using single or multiple biopolymer layers. The effectiveness of these carrier matrices can be optimized by altering the biopolymers present, concentration and viable payloads.[14] The structural integrity of capsules is key to the survival of bacteria; however, capsules must be insoluble at the acidic pH of the stomach but dissolve under the alkaline pH of the intestine to time the release of the entrapped microorganisms. Capsules must also ensure the stability of viable bacterial counts during manufacturing (particularly during drying or freeze-drying of the product) and storage. Materials that meet these requirements must be non-toxic and thus typically are based

Reviews

REVIEWS

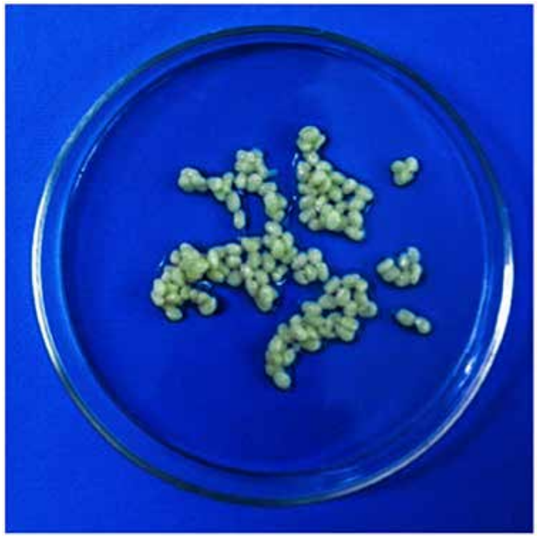


Figure 1. Fresh iota-carrageenan – pea protein capsules containing immobilized probiotics.

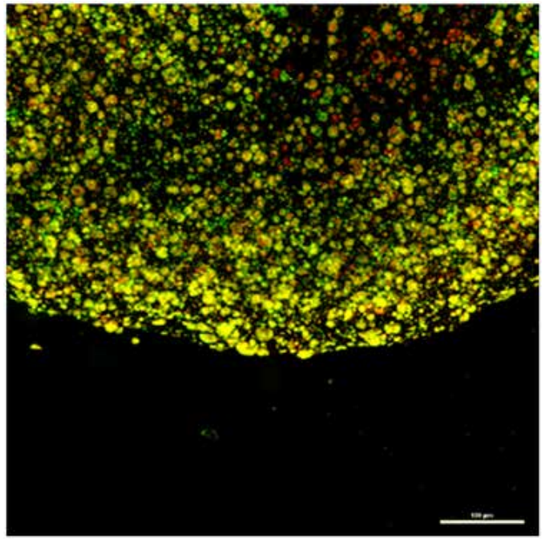


Figure 2. Confocal laser scanning microscopy image of the surface of an iota-carrageenan-pea protein capsule containing immobilized probiotics. Bacteria may be observed as small green or red fluorescently stained objects whereas pea protein emits a yellow autofluorescence. Scale bar – 100 µm.

on polysaccharides (sodium alginate, carrageenans, gums) and proteins (pea, whey). These substances have been widely-tested as potentially useful for encapsulation of probiotics. In order to enhance protection of immobilized bacteria, polysaccharides may be mixed with proteins to produce capsule wall material with desired characteristics (Figures 1 and 2). The most common polysaccharide used in probiotic microencapsulation studies is sodium alginate due to its ability to form a gel in the presence of divalent cations, a feature that makes the production of bacteria-containing capsules a fast and easy process. While microencapsulated probiotics have not yet gained popularity over dried and freeze-dried microorganisms in the health-food market, they have proven to be an effective delivery tool for bacteria used for the treatment of GIT disorders in human clinical trials.[15,16]

QUESTIONS SURROUNDING HEALTH CLAIMS AND THE EFFICACY OF PROBIOTICS

Health Canada is responsible for developing the proper use of terminology and allowable health claims as it relates to probiotics. Terms and phrases used on food packages, such as *'probiotics'*, '*…with beneficial probiotic cultures*', or '*…contains bacteria that are essential to a healthy system*' are all allowable only when they can be validated for the specific probiotic strain present within the food. Allowable claims must be supported by scientifically proven physiological effects associated with maintaining or supporting good body health and performance (e.g., promotes regularity, improves mineral absorption and helps with digestion). However, more general statements, such as '*promotes gut health*' or '*supports immune function*' are not allowed. Validation of these claims in Canada are dealt with by the Food and Drugs Act and involves a systematic review of all of the scientific evidence collected by individuals/companies that implies an effect by the consumption of each individual probiotic strain taken at set doses associated with that claim.

The majority of probiotic products available on the market are generally considered beneficial for human health; however, there remains a lack of evidence as to their efficacy in treatment of specific gastrointestinal disorders. In order to be considered a medication, a product must undergo clinical trials where it must be proven equally, or more effective, than a standard treatment for a specific condition.[13] Currently, most probiotic research is at the *in vitro* study stage, where putatively-beneficial bacteria are tested in the lab for their ability to inhibit the growth of pathogens, produce antimicrobials and vitamins and withstand simulated conditions of the upper GIT. Strains demonstrating probiotic potential are then tested in animal models against a specific gastrointestinal disorder and, if found effective and safe, in human clinical trials. Results of multiple trials involving humans suggest that certain bacterial strains are indeed effective in the treatment and prevention of antibiotic-associated diarrhea (*Saccharomyces cerevisiae, Lactobacillus rhamnosus GG*), irritable bowel syndrome (*Lactobacillus acidophilus*) and viral gastroenteritis (*Bifidobacterium longum*).[15,17-18] VSL#3, a mixture of several bacterial species (4 Lactobacilli strains, 3 Bifidobacteria strains, and one strain of *Streptococcus spp.*), has been shown to be effective in treatment of pouchitis according to the results of three trials.[20] However, in order for these probiotics to enter the market, the findings of human clinical trials must be highly reproducible and on a much larger scale. Additionally, the strain with claimed probiotic properties must be well characterized, and the mechanism of providing the specific health benefit must be explained in detail. Due to failure to meet these requirements, many potential probiotic products are being rejected as inappropriate for food market as they lack sufficient "scientific substantiation of the claim" or because "the cause and effect relationship has not been established" between the consumption of a probiotic product and the health benefit it claims to provide.[21,22] Other important considerations are the long shelf-life of a probiotic-containing product and its ability to provide sufficient protection for bacterial cells during transit through the human GIT in order to preserve the probiotic effect.

The integration of new techniques for bacterial cell protection, such as microencapsulation, into probiotic research and industrial application will lead to the emergence of novel forms of functional food products that would ensure the effective targeted delivery of selected probiotics in sufficient amounts to have their benefit on the host organism.

Department of Food and Bioproduct Sciences, University of Saskatchewan, Saskatoon, SK

*(*Corresponding author email: Darren.Korber@usask.ca)*

References

[1] Tuohy, K.M. et al. (2012). *J Agric Food Chem* 60:8776.
[2] Doré, J. & Corthier, G. (2010). *Gastroentérol Clin Biolog* 34:S7.
[3] Delzenne, N.M. et al. (2011). *Microb Cell Fact* 10(1):1475.
[4] Naseribafrouei, A. et al. (2014). *Motil* 26:1155.
[5] Aureli, P. et al. (2011). *Pharmacol Res* 63:366.
[6] Kotzampassi, K. & Giamarellos-Bourboulis, E.J. (2012). *Int J Antimicrob Agents* 40:288.
[7] Report of a Joint FAO/WHO Expert Consultation on Evaluation of Health and Nutritional Properties of Probiotics in Food Including Powder Milk with Live Lactic Acid Bacteria (October 2001). *Health and Nutritional Properties of Probiotics in Food including Powder Milk with Live Lactic Acid Bacteria*. Food and Agriculture Organization of the United Nations, World Health Organization.
[8] Perdigon, G. et al. (2002). *Eur J Clin Nutr* 56(4):21.
[9] Collado, M.C. et al. (2007). *Lett Appl Microbiol* 45:454.
[10] Wallace, T.C. et al. (2011). *Nutr Rev* 69:392.
[11] Hamilton-Miller, J.M.T. (2003). *Int J Antimicrob Agents* 22:360.
[12] Sanz, Y. (2007). *Int Dairy* J 17:1284.
[13] FAO/WHO. *Guidelines for the evaluation of probiotics in food*. London, Ontario: Food and Agriculture Organization of the United Nations and World Health Organization Working Group Report (2002) 1–11.
[14] Tripathi, M.K. & Giri, S.K. (2014). *J Funct Foods* 9:225.
[15] Sinn, D.H. et al. (2008). *Digest Dis Sci* 53:2714.
[16] Omar, J. M. et al. (2013). *J Funct Foods* 5:116.
[17] Lee, D.K. et al. (2014). *Clin Res Hepatol Gastroenterol. In Press.* doi:10.1016/j.clinre.2014.09.006.
[18] Videlock, E.J. & Cremonini, F. (2012). *Aliment Pharmacol Ther* 35:1355.
[19] Vanderhoof, J.A. et al. (1999). *J Pediatr* 135:564.
[20] Saad, N. et al. (2013) LWT – *Food Sci Technol.* 50:1.
[21] European Food Safety Authority (EFSA), 2012. Scientific Opinion on the substantiation of health claims related to *Lactobacillus casei* DG CNCM I-1572 and decreasing potentially pathogenic gastro-intestinal microorganisms (ID 2949, 3061, further assessment) pursuant to Article 13(1) of Regulation (EC) No 1924/20061.
Available at: http://www.efsa.europa.eu/en/efsajournal/doc/2723.pdf
[22] European Food Safety Authority (EFSA), 2014. Scientific Opinion on the substantiation of a health claim related to "*Lactobacillus plantarum* TENSIA® in the semi-hard Edam-type "heart cheese" of Harmony™" and maintenance of normal blood pressure pursuant to Article 13(5) of Regulation (EC) No 1924/20061. Available at: http://www.efsa.europa.eu/en/efsajournal/doc/3842.pdf

The Food Industry's Conundrum About GM Labelling

Stuart Smyth

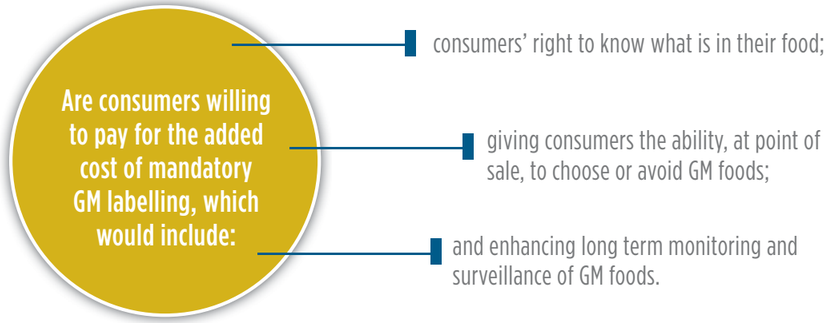
In the mid-1990s, genetically modified (GM) crops and their resulting food products entered the North American and European markets virtually unnoticed. In fact, products in Europe labelled as containing GM ingredients and being made from GM products outsold similar products in the late 1990s. In Canada and the USA, GM crops and products triggered minimal consumer concerns or even awareness. So, what has changed? Why is it routinely reported that consumers are increasingly demanding that food products be labelled as to whether they contain GM ingredients? Why are various American states holding referendums on GM labelling? This review will provide insights into the rise of the GM labelling issue and offer some thoughts on a means of moving forward.

THE DEBATE

In Canada, it has been estimated that GM foods and food ingredients are detectable in 11% of foods consumed and might be present (but often not detectable) in up to 75-80% of the processed foods sold in stores. Examples range from GM papaya and GM sweet corn that are directly consumed, to sucrose and fructose from GM corn that are used as sweeteners in numerous products, GM enzymes that are used in cheese production[1] and GM yeast[2] used in the baking industry. Although regulators around the world have ruled that there is no scientific evidence to support claims that these foods involve any new or magnified risks, many civil society groups and a large portion of consumers are simply not convinced. In absence of any definitive long-term studies showing these foods are safe, and in response to heightened apprehension about food safety issues, civil society groups and consumers seek mandatory labelling for GM foods. The reasons offered in defense of mandatory labels include: consumers' right to know what is in their food; giving consumers the ability, at point of sale, to choose or avoid GM foods; and enhancing long term monitoring and surveillance of GM foods.

The demand from consumers to know what is in their food is not a standalone issue, but part of a greater societal movement pertaining to our proximity to food. Witness the concern about horsemeat contamination of beef in Europe, mandatory nutrition and country of origin labelling in many countries, the inclusion of calorie counts for meals in restaurants and the rise of urban gardening as a means of shortening food chains. All of these examples indicated that consumers are increasingly concerned about potential risks related to their food consumption habits, and perhaps more importantly these examples indicate that consumers want recourse to accountability in food systems that traceability and other documentation are intended to support.

At root, labelling is about providing accessible and meaningful information to consumers. Information is like money, in the sense that people will generally respond that they would prefer to have more of it rather than less. An interesting aspect of money, however, is that happiness does not always follow affluence. After a certain point, as reports from late-stage industrialized countries indicate, more money is actually associated with less happiness, and many people will trade money for other things they value, like health or time. Following this analogy, a question can be raised about access to information. Does a similar pattern exist for information, such that the desire for more information, and the ability to access that information, reaches a saturation point where new information does not improve welfare and perhaps even undermines well-being? A further question can be raised about whether the impulse for more information needs to be considered in the sobering light of how useful the information is in the context of daily life, particularly when the information might be traded off for other considerations deemed more valuable?



When Canadians are asked if they would prefer to have information about whether their food is GM, or contains GM ingredients, nearly all say they want the information. The issue of labelling, whether it is mandatory or voluntary, spans the full spectrum of opinions. Environmental groups and critics of biotechnology claim that greater than 95% of consumers responding to surveys indicate that they want GM content to be labelled, but other surveys show that only 2% of unprompted consumers ask for GM labelling. The real demand for labelling lies somewhere between the two; determining whether it is greater or less than 50% should help to determine what type of labelling is optimal.

THE COST OF INFORMATION

Because labelling is one among several factors contributing to cost, producers and packagers have an interest in whether the effect of labelling GM contents in foods will meet consumers' desire to have this information, while at the same time generating adequate revenues to recoup the extra costs associated with any label change. Marketing products to consumers involves a complicated mix of label messages, consumer knowledge and product context. All these factors may influence the willingness of consumers to pay for GM products or to avoid them. The major challenge in determining how much consumers would be willing to pay to have increased labelling information is that wherever possible, people want information at little or no cost to themselves. Frequently, critics of biotechnology make the statement that 'labelling for GM is costless – all that is required is to put a label on the products.' Obviously, nothing is free, but the challenge is to determine what the costs are and who should bear them. Consumer studies can assist in determining the aggregate value individuals place on this information, and should allow us to determine the optimal amount of information that should be provided.

Market surveys[3] show that many US consumers do not understand the term GM-free when used in product label information. Using simulated test markets for salty snack food and fresh packed vegetables, eight characteristics were offered to inform the consumer about the product. The characteristic 'free of genetically modified ingredients' was the lowest rated. This experiment also revealed that consumers, who before the experiment indicated that GM-free ingredients were 'extremely' or 'very' desirable when making a purchase decision, did not express more interest in the food products labelled GM-free than in products labelled GM when faced with actual purchase choices.

Some literature suggests that consumer willingness to pay for products labelled as GM can vary widely.[4] Consumer preference for products labelled with a 1% tolerance level versus a 5% tolerance level were studied, finding that consumption of products labelled as GM would drop 7 – 13% regardless of whether the tolerance level was 1% or 5%. The authors reported that there is no statistical support for US consumers having a preference for a 1% tolerance level over a 5% tolerance level. They concluded that if the US wanted to adopt a tolerance level for the labelling of GM food products, 5% would be the socially-optimal level.

The debate about labelling has raised two challenges. First, it is not clear if there are economic incentives for firms to voluntarily provide GM labelling information. If there is no economic incentive, the market will not spontaneously provide this information. Instead, firms will provide what is most profitable and least risky, which could mean that only GM or only GM-free products would be available, depending on the country, or that precautionary labelling claims (such as 'may contain') would be used. Both of these alternative outcomes would not necessarily improve consumer information. If GM labelling is perceived to be of political value, governments have the option of requiring mandatory labelling; in this case the cost of labelling for GM content would be shared between the industry and consumers. Given that each food category faces different prices, the range of costs would vary widely across the

Reviews

food basket. There is growing evidence that consumers might not derive enough value from the added information to justify this cost – at least in some markets where consumers might end up bearing most or all of the incremental costs. Even where economic incentives might exist, it is not clear how the various supply chains would provide greater information about GM food products to consumers.

Recent voting initiatives in the US illustrate just how divided consumers are on this issue. Beginning in California in 2012 with Proposition 37 that called for mandatory labelling for GM content in all food products, several other states have held referendums or enacted legislation. Referendums on labelling have been held, and defeated, in California, Colorado, Oregon and Washington. Communicating and informing voters about the increased food costs of mandatory GM labelling has cost the agriculture and food sectors in excess of US$110 million. Maine and Connecticut have enacted legislation mandating GM labelling, however, this is premised on neighbouring states, having a regional population above 20 million, also enacting similar legislation. In 2014, Vermont passed legislation making GM labelling mandatory, however, this law is presently being challenged in the courts by the Grocery Manufacturers Association, the Snack Food Association, the International Dairy Foods Association and the National Association of Manufacturers, citing that the Vermont state law contravenes federal legislation.

One persistent concern across the debate over GM labelling is the cost. How much will it cost? Who will pay? Ultimately, consumers will pay. A study on the price increase of food products based on the debate in California in 2012 estimated an increase of US$400 per year.[5] This represented an increase of about 8-10%, for a household to purchase the same groceries they presently purchased. As identified above, simply putting a 'may contain' label on a food product provides consumers with no valued information about the food product and therefore, firms in the food industry would have to individually verify the source of every single ingredient used in their food preparation and development processes to be able to credibly label food products. This, of course, costs money. Depending on the product and the firm, some of these costs may be borne by the firm, but in most instances the full expense of these costs would be passed on to consumers.

A final concern is that there is a strongly held consumer notion that labelling for GM content implies that there is a hazard or danger related to this label. This is predominantly due to environmental groups claiming that GM food products are 'Frankenfoods', thus implying there is some type of danger from consuming such products.[6] Firms in the food industry remain unconvinced that differentiating GM products from non-GM products will not adversely impact sales of the GM labelled products. Given that the food industry does not perceive there to be a value to provide consumers with increased information about whether or not a food product contains GM, the probability of GM labels becoming commonplace, is remote.

A FINAL THOUGHT

Returning to the analogy between information and money, perhaps it really is the case that information about GM foods is desirable in the way that more money is desirable, but only in the narrow sense that it can be traded for other valuable things. If this is true, then there is less presumptive support for mandatory labels than it would first appear. Clearly, if consumers were expressing true aversions to foods that may contain GM ingredients, this would be evident through reduced sales. Given that the food industry has not shifted to voluntarily label, indicates that consumer support is high when surveyed about their labelling preferences, but their revealed preferences when inside a grocery store bear little correlation to their stated preferences. Ultimately, many consumers may say they want GM labelling, but few to none are willing to pay higher food prices to have this piece of information added to existing food labels. The economics of consumer labelling is that if consumers are willing to pay for it, then firms will provide it. Until then, the labelling debate will continue to be waged.

References

[1] GMO Compass. (2010).http://www.gmocompass.org/eng/database/enzymes/83.chymosin.html (Accessed December 2014).

[2] GMO Compass. (2009). http://www.gmocompass.org/eng/database/ingredients/124.yeast.html (Accessed December 2014).

[3] McGarry Wolf, M. et al. (2004). In R. E. Evenson and V. Santaniello (eds.) *Consumer Acceptance of Genetically Modified Foods*, Wallingford, UK: CABI Publishing, pp. 53-59.

[4] Rousu, M. et al. (2007). *Economic Inquiry*, 45:409-432.

[5] Zilberman, D. (2012). http://blogs.berkeley.edu/2012/12/20/lessons-from-prop-37-and-the-future-of-genetic-engineering-in-agriculture (Accessed December 2014).

[6] Huffman, W. E. & McCluskey, J. J. (2014). In S. J. Smyth, P. W. B. Phillips and D. Castle (eds.) *Handbook on Agriculture, Biotechnology and Development*, Cheltenham, UK: Edward Elgar Publishing, pp. 467-487.

Department of Bioresource Policy, Business and Economics, University of Saskatchewan, Saskatoon, SK

*(*Corresponding author email: Stuart.Smyth@usask.ca)*

FINGER ON THE PULSE

THERE'S MORE TO PULSES THAN SOUPS AND SALADS AS BOTH THE U.N. AND INDUSTRY LOOK TO RAISE AWARENESS AND CELEBRATE THE ROLE OF BEANS, CHICKPEAS, LENTILS AND PEAS IN FEEDING THE WORLD

Text by Hermione Wilson

The United Nations has declared 2016 the International Year of Pulses and the Canadian pulse industry is eager to raise awareness about the many uses and health benefits of their crops. Despite being a major producer of pulses, Canada's consumption is fairly low when compared to other countries. Canada is one of the largest suppliers of imported pulses for India, the world's largest producer, consumer and importer of the crops. Pulses, especially lentils, are an integral part of the traditional Indian diet, and the country is struggling to keep up with the increasing demands of a rapidly growing population.

CANADA PRODUCES
6 MILLION
TONS OF PULSES!

3.8 MILLION
TONS OF PEAS

1.9 MILLION
TONS OF LENTILS

400,000
TONS OF BEANS AND CHICKPEAS

14 per cent of land in Saskatchewan is dedicated to pulse crops

At home, Canadian consumers don't seem to know what to do with pulses, besides throwing them into soups or salads whole. According to an Ipsos Reid report, commissioned by Alberta Agriculture and Rural Development and Pulse Canada in 2010, most Canadians didn't know what pulses were. They reported that two of the biggest factors preventing them from consuming pulses were not having pulses in mind when they were preparing a meal and not knowing how to cook or prepare them. Only 20 per cent of those surveyed indicated that they ate at least one type of pulse on a weekly basis, and according to the study, the estimated average weekly pulse consumption among this group was 1.3 cups.

Apart from being environmentally friendly, pulses are pretty friendly to the human body as well. They are high in protein and fibre, as well as essential vitamins and minerals like iron, potassium and folate.

"There's definitely potential to increase domestic consumption," says Heather Maskus, project manager for the Canadian International Grains Institute's (CIGI) Pulse Milling and Utilization Project. "From a Canadian perspective, we're really not taking advantage of a healthy, nutritious crop that is actually grown right here. The majority of what we produce is exported."

A CANADIAN CROP

Canada produces six million tons of pulses, a significant amount even when compared to the 15 to 20 million tons of canola and more than 25 million tons of wheat Canada produces. Where pulses are concerned, Saskatchewan is at the centre of the action. The province produces about 80 per cent of what Canada produces as a whole and has dedicated 14 per cent of its land to the category.

"[Pulses] have been important for farmers to be able to diversify their crop rotations," says Carl Potts, Executive Director of Saskatchewan Pulse Growers. "They also have some very positive environmental benefits," he adds. Potts is referring to the fact that pulses, because they are a legume crop, don't need special nitrogen fertilizer to grow. In fact, they take nitrogen from the air and convert into a form the plant can use, leaving the soil rich in nitrogen for subsequent crops.

Apart from being environmentally friendly, pulses are pretty friendly to the human body as well. They are high in protein and fibre, as well as essential vitamins and minerals like iron, potassium and folate.

"There is a fair bit of evidence that is linking pulse consumption to things like blood sugar control and cardiovascular disease risk [reduction]," Potts says. Further research is still needed in this area before manufacturers can make health claims, he says, but in the meantime, the idea that pulses can be used to boost the health profile of other food products is generating interest among manufacturers.

Pulses are very unique in that they contain plant proteins, although that plant protein is not necessarily complete, says Tanya Der, Food Innovation and Marketing Manager at Pulse Canada. "[Pulses] are very high in protein and they have an amino acid profile that is very complementary to other cereal grains such as wheat, corn, rice, or even oats," says Der. "The question is, can you get these same health benefits in a processed food product?"

A SUM OF ITS PARTS

When Canadians think of pulses, they often picture them in their whole or split state and being eaten as some sort of soup or stew. Milling pulses into flour and flakes, or breaking them down through fractionation into starch, protein and fibre, allows pulses to be used in other ways, however. Saskatchewan Pulse Growers invests substantially in research that is changing the traditional perception of pulses and exploring the different ways they can be used as components of other food, Potts says. For example, pulses can be used as starches and thickeners in gluten-free pastas or bread, or as coatings for meat products, where they enhance texture and reduce oil absorption.

"What we as an industry are striving for is to create the capacity to supply pulse flours that are consistently functional, that can be used in specific food applications, whether it is in bread or putting it into a meat product as a binder," says Der. "We hope that the end results are ingredients that are functional, that can be used in a series of food applications, and that can improve the nutrition and health profile of the food."

Aside from their potential to replace wheat for those with gluten allergies, pulses also offer consumers a way to diversify their diets, Maskus says. "One of the biggest benefits we're seeing here is that pulses help to provide that complementary protein base when used in combination with wheat," Maskus says. There is also a lot of interest in the way pulses complement other cereal grains when they are combined, she says. Producers of snack foods such as extruded products and chips have likewise embraced pulses as an essential ingredient.

"Here at the Canadian International Grains Institute, we're trying to understand more about the functionality and utilization [of pulses]," Maskus says. "They can be a really healthy, nutritious part of a diet and are also very tasty and highly versatile."

Canada is the largest producer of peas and lentils in the world

IN 2013, **700 NEW PRODUCTS THAT CONTAINED PULSES** WERE LAUNCHED IN NORTH AMERICA, COMPARED TO THE 150 NEW PRODUCTS LAUNCHED IN 2004.

Stats courtesy of Pulse Canada

SAY CHEESE!

PHILIP BÉLANGER SHARES HIS PASSION FOR CANADIAN CHEESE

Text by Lekha Kanagasabai

A passionate cheese connoisseur, Philip Bélanger has gone, seen, and conquered the ends of the cheese world, tasting the finest there is to offer. "After exploring various cheeses from all over the world, I really fell for the ones in Canada," he says.

Bélanger is Jury Chairman of the Canadian Cheese Grand Prix. In fact, he is the competition's longest-standing jury member, having been a part of it since its inception in 1998. Recently, cheese makers from British Columbia to PEI submitted 268 cheeses from 27 different categories in the competition. A panel of Canadian food industry experts gathered in Montreal selected 81 finalists that exemplified the world-class calibre of cheese being produced in Canada today.

This year, nine new categories were added to the competition. Though the champions won't be unveiled until April, it was an extensive process where the jury members tasted all of the cheeses, beginning with the milder ones and progressing to the more full-bodied varieties. Each cheese was carefully observed, touched, smelled, and tasted, and evaluated based on very specific criteria including flavour, texture and body, colour, appearance, finish, and salt content.

"Canadian cheese makers are expanding their repertoire and producing unique, highly impressive, top quality cheeses," says Bélanger.

WHAT IS THE BIGGEST CHALLENGE FOR COMPETITORS?

The toughest part is the evaluation itself. To me, everyone has chance to win and that's why it has everything to do with your score within the category. The big competition is to choose the grand champion among all winning categories. In that respect, they're all winners. It's a tight race.

DO THE STAKES GET HIGHER AND THE COMPETITION GET TOUGHER EVERY YEAR?

Absolutely. I go back to 1998 and from my recollection, we had maybe 64 cheeses to evaluate out of five categories and now we have 27 categories and 268 cheeses. A large amount, compared to 2013 when we only had 225. So definitely, not only the quantity, but the quality, is continuously becoming a closer and closer [race] every year.

YOU'VE GIVEN SEMINARS AND EDUCATIONAL PRESENTATIONS ON CANADIAN CHEESE. WHAT IS YOUR GOAL WHEN YOU PROMOTE OUR CHEESE INDUSTRY?

I've always had such a passion for cheese. Especially after exploring various cheeses from all over the world, I really fell for the ones in Canada. I saw the passion and the excellence here in Canada and I started getting involved with Dairy Farmers of Canada in the early 90s. I could envision that we'd become the envy of other cheese making nations of the world.

YOU'VE TRAVELLED ALL OVER CANADA AND TASTED THE FINEST OF CHEESES. WHAT ARE SOME OF YOUR PERSONAL FAVOURITES?

I like the more pronounced flavours like old gouda and old cheddar. I love blue cheese as well.

WHAT ARE SOME OF THE MUST-HAVE CHEESES EVERY CANADIAN NEEDS IN THEIR PANTRY?

I wouldn't neglect a gouda, or a feta, but in this day and age, there are all kinds of flavoured cheeses. Depending on your taste, if you like hot chilli pepper, garlic and herbs, these are all excellent cheeses to consider as well, especially if you're talking cooking.

Helping **delight** and **nourish** consumers across the globe

Contact Kerry's Canadian team to discover the many ways we can help you deliver better taste and nutrition in your food and beverage products.

KERRY

888.578.0841 | INFO.GRANBY@KERRY.COM
WWW.KERRYGROUP.COM