> VOLUME 3, ISSUE 2 > SUMMER 2015

Canadian food Insights

SUMMER *flavours*

TRENDS IN
ICE CREAM, DRINKS + BBQ

ARLENE DICKINSON

LAUNCHES FOOD AND BEVERAGE ACCELERATOR

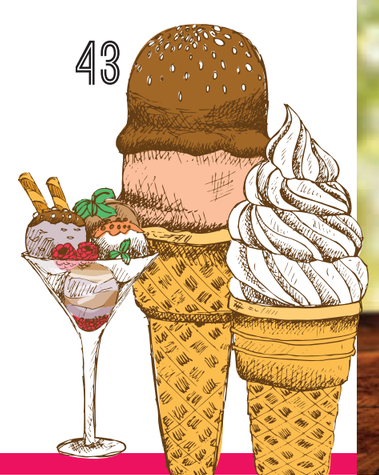
The official magazine of CIFST
www.cifst.ca

Mintel Intel 18

Global market intelligence agency Mintel gives us the 411 on summer beverage and ice cream trends. Part of an ongoing series.

feature stories

regular departments



feature REVIEWS

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2015 Kenneth R. Wilson Awards Finalist CKW
Recognizing leadership, innovation and excellence in the food industry

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Theresa Rogers

EDITOR FOR

CANADIAN FOOD INSIGHTS

MIXING SCIENCE AND TRENDS

I find the science of food fascinating. That's why I love this magazine. It's the perfect opportunity to stay in touch with all of the important industry trends and then talk to the people behind the scenes who are working to translate those trends into the things we eat.

At *Canadian Food Insights*, we've formed an exclusive Canadian partnership with Mintel, a world-leading market intelligence agency. Each issue we'll be bringing you "Mintel Intel", food intelligence from Mintel's international network of field researchers and food analysts. We're working together to blend data, knowledge, foresight and innovation into actionable insights you can feed into your strategy and development processes.

Arlene Dickinson is also talking trends in this issue. She's probably one of Canada's most recognizable people from her eight seasons on the TV show, *Dragon's Den*, but oh yeah, she also runs her own marketing company and she's out to win. Her latest venture is a food and beverage accelerator called District Ventures which will feature office space, equipment, and most importantly, the tools and coaching entrepreneurs will need to take their ideas to the next level. She's also launching a fund to invest in companies in the food and beverage and health and wellness spaces.

Dickinson told me "gluten-free" is one trend that's evolving and it won't be going away any time soon. Then, as we were going to print, the Honourable Rona Ambrose, Minister of Health, announced changes she says will result in more safe food choices for Canadians with celiac disease by approving "gluten-free" claims on specially produced oats and foods containing these oats.

Gluten-containing grains such as wheat, rye and barley are widely used in the production of many foods but people with celiac disease must avoid eating the gluten protein found in these grains to manage their condition. Health Canada says recent evidence shows that oats can safely be consumed by the majority of people with celiac disease, as long as they have been produced and processed to avoid cross-contamination by gluten from other cereals. Health Canada will now allow specially produced oats with trace amounts of gluten to carry a "gluten-free" claim.

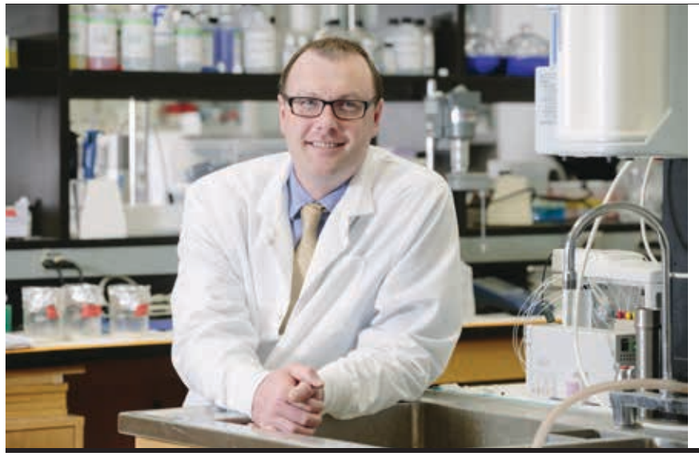
A press release says the decision is based on current scientific evidence, which shows that it is safe for the majority of people with celiac disease to eat specially produced oats, so long as they do not contain more than 20 parts per million of gluten from wheat, rye, barley or their hybridized strains. This labelling change opens a new segment of the market to Canadian oat growers and food processors.

It's summer, so make sure you check out the trends articles on ice cream and warm weather beverages in this issue, and see how Sensus is helping customers swap out that five-letter word, sugar, for healthier inulin.

See you at IFT!

Sincerely

Theresa Rogers



Michael T. Nickerson, Ph.D., P.Ag.
SASKATCHEWAN MINISTRY OF AGRICULTURE RESEARCH CHAIR
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Welcome everyone to another great issue of *Canadian Food Insights,* just in time for summer. It's been a jam-packed, amazing few months since our last issue for the Canadian food and beverage sector, as our landscape north of the border is constantly changing. In this issue we feature three exciting new review articles. The first is entitled, *'Fat: The Good, the Bad, and the Tasty',* which highlights some research related to removing some of the trans fat in our diet in favour of healthy alternatives. The second focuses on *'Canada's Role in Fighting Global Food/ Nutrition Insecurities',* and discusses some of Canada's research initiatives in terms of combating global hunger issues. And lastly, an article entitled, *'Food Recall Strategies for Small Business',* gives a practical insight to handling various food recall scenarios for small and medium businesses in the food industry. Canadian Food Insights is also carrying on with the clean label theme within the '*Regulatory Arena*' section. And for the rest of this issue, well, it highlights stories from across the country in the food and beverage sector, such as a recap of the Centennial Symposium in Advances in Ice Cream Science and Technology at the University of Guelph, recent trends from Mintel, and an exciting new venture from Arlene Dickinson. *Canadian Food Insights* is also proud to have a presence at this year's Institute of Food Technologists' Annual Meeting & Food Expo in the windy city (Chicago, IL) so we can showcase Canada to the North American and global markets. As always, I would like to thank my entire Editorial Board and Dovetail Communications for continuing to deliver on the needs of the Canadian food and beverage sector. So sit back, and enjoy another great read.

Sincerely

Michael T. Nickerson

food EVENTS 2015

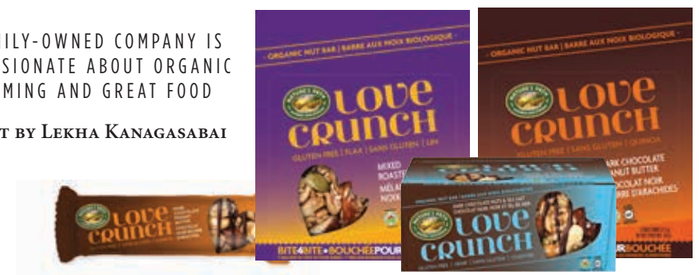
July 11-14	August 4-7	August 23-25	Sept. 15-18
IFT Annual Meeting & Food Expo	*Confitexpo*	*Western Foodservice & Hospitality Expo*	*Process Expo*
CHICAGO, IL	GUADALAJARA, MEXICO	LOS ANGELES, CA	CHICAGO, IL

COMPANY PROFILE

Nature's Path Celebrates 30 Years

FAMILY-OWNED COMPANY IS PASSIONATE ABOUT ORGANIC FARMING AND GREAT FOOD

Text by Lekha Kanagasabai



A pioneer in the organic and non-GMO movement, Nature's Path has remained a proudly Canadian, family-owned and operated company for 30 years. Arran and Ratana Stephens, the husband and wife team behind the organic empire, have dedicated their lives to supporting sustainable and regenerative agriculture, as well as creating cereals and snacks that are certified organic, natural, and of course, delicious. Producing its first flakes in 1985, the company has since broadened its range of products to a multitude of snacks and cereals, with products meeting mouths in more than 42 countries worldwide.

Starting out as a small husband and wife operation in the back of their vegetarian restaurant, Arran says that they "hadn't a clue how to make ready-to-eat breakfast cereal." Now celebrating their 30th anniversary, Nature's Path is still run by the duo, along with their three children. Nature's Path has grown into an empire with a wide range of products to meet customer demands. "Regardless of changing trends in food, be it low sugar or high protein, our dedication and passion for making quality, organic foods always remains true," Arran says.

With their driving philosophy aiming to "always leave the earth better than we found it," Nature's Path strives to provide quality organic foods in every home with a triple bottom line to be socially responsible, environmentally sustainable and financially viable.

Arran cites innovative product ranges like Qi'a Superfoods and programs like Bite4Bite, a fund which donates up to $1 million annually to food banks, to illustrate how they have survived for 30 years amongst a sea of larger companies. Arran says that while some of the bigger food giants within the industry are buying up organic brands to add a healthier halo to their portfolio, his company's independence has kept it passionate and inspired to create better products for consumers. The increasing interest in organic foods also keeps the Stephens on their toes, producing newer and better innovations for organic eaters.

"We don't just make delicious organic cereal because it is good for business," says Arran. "We make cereal because it allows us to do good things, like protect organic farmland and keep toxic chemicals out of our environment and off your plate."

Summer Means It's BBQ Season

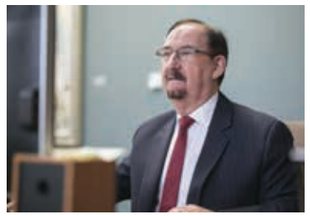
The recently released 25th annual Weber Canadian GrillWatch Survey offers some interesting stats on who, what, where, when, and why Canadians grill.

- Canadians are heavy grillers with (84%) admitting to firing up the barbecue at least twice a month.
- Father's Day is the third most popular time to barbecue (54%) after Canada Day (68%) and birthdays (62%).
- Hamburgers are the food most-often grilled, with 87% of respondents having grilled them in the past year.
- Steak is still the top all-time most favourite food to grill (44%).
- Tongs are tops when it comes to accessories owned (80%), followed by a basting brush (73%) and a wire bristle grill brush (70%).
- A whopping (91%) of Canadian grillers own a gas grill, while charcoal grills are favoured by (21%) of Canadian grillers.

Sept. 17-19	Sept. 28-29	Oct. 4-5	Oct. 8-11	Oct. 22-24
CFHA East Conference and Show	*Grocery Innovations Canada*	*The Canadian Coffee & Tea Show*	*IBIE*	*North American Millers' Association Annual Meeting*
TORONTO, ON	TORONTO, ON	VANCOUVER, BC	LAS VEGAS, NV	PHOENIX, AZ

PEOPLE PROFILE

Feeding a Growing Population



Text by Lekha Kanagasabai

Maurice Moloney has been involved with the plant agriculture and biotech industry for almost 30 years. A renowned food and agriculture scientist, Moloney was appointed Executive Director and CEO of the Global Institute for Food Security (GIFS) in 2014, a public-private partnership substantially funded by Potash Corporation and the province of Saskatchewan.

A largely pressing issue, food security deals with the availability of sufficient, nutritious food of quality that is socially acceptable to a consumer, which, Moloney specifies, takes into account various restrictions such as religion. With more than one billion people significantly malnourished, GIFS focuses on the science and policy affecting global food security, with the institute based in Canada's very own breadbasket, Saskatchewan. Moloney says GIFS handles food security on both a local and global perspective.

"Saskatchewan plays a very significant role in global food security. If one were to imagine that a wheat disease spread through Saskatchewan and knocked out wheat crops, we'd see an effect, not only locally, but globally."

The reality is that malnutrition has been the leading cause of death in a number of countries around the world. In 2010, the United Nations reported 925 million undernourished people, a number largely made up of areas in Asia, the Pacific, and Sub-Saharan Africa respectively. GIFS looks into these issues and their causes – with the primary focus revolving around seed development, soil development, and digital agriculture. Scientists and researchers are looking into developing crops that are low maintenance and have the ability to protect themselves from environmental effects such as insects and disease.

"There's a big opportunity there to increase yield in cooperation with hybrid vigour in the seed," Moloney says adding such technologies would vastly improve economies in both the developed and developing world.

Soil development also plays a large part in increasing production of crops. Moloney says that given the ability to increase organic matter in soil, it would also retain more moisture and nutrients to eventually produce more fertile soil.

Digital agriculture deals with the intercept between information technology and agriculture in all its different forms. In the developed world, farms will become monitored and wired, allowing farmers to understand everything about their fields. From moisture content to nutrient status to PH levels, there are a number of factors that could be monitored to aid in the early detection of soil-borne diseases.

Moloney plans on developing his newest endeavour into a functioning institute with members and its own research programs. He says GIFS is currently in the process of hiring internationally renowned talent and hopes to expand what is now a skeleton staff to a team of more than 50 people by this time next year.

Swatch Does Food with New Collection

Colour, flavour and energy – what would life be without the joys of travel, tastes that entice the tongue and wonderful company around the table?

The Swatch Dolce Vita Collection mixes food, art and timing. Tomatella, Onione, Vitamine Boost, and Sardina bring fun and colour to the wearer in a trendy, tasty way. Together they complete a menu, and individually they tantalize the taste buds and serve as a vibrant sight for sore eyes – a truly sensory experience.

Each piece retails for $75 at Swatch stores across Canada.

INGREDIENTS *for* GROWTH

ARLENE DICKINSON TALKS **MARKETING, MONEY** AND **MAKING IT**

Text by Theresa Rogers

Image courtesy of CBC

It's early on May 6 and I'm speaking to Arlene Dickinson on the phone from Calgary. Rachel Notley has just won the Alberta provincial election, becoming the province's 17th premier and forming the first NDP-led government in the history of the province.

Everyone knows it's been a bumpy few years for Canadian manufacturing, including food manufacturing, and that Alberta has its own financial woes at the moment. I ask if the new government in Alberta will help or hurt business.

"I think there's lots of room for new policy," Dickinson says. "I don't believe that anyone wants to see the economic endowment suffer. I think we all want to grow this province and it seems to me that we have to give the new premier an opportunity to share what kind of policies will actually help us grow. It's too early to say but I'm hopeful."

This is the diplomatic but straight-talking woman Canadians know from her eight years on *Dragon's Den*. In a way, Dickinson is so much more than a Dragon. She is the marketing genius in charge of Venture Communications, her full-service marketing agency. She is also an author and philanthropist. In another way, she is a Dragon through and through: a fierce, entrepreneurial venture capitalist. It's who she is.

Her latest venture is a business accelerator located in downtown Calgary called District Ventures. The first accelerator of its kind in Canada, District Ventures will focus on growing companies in the food and beverage and health and wellness sectors. Dickinson describes the accelerator as a community for driven entrepreneurs where they can network, access strategic investors – she's in the process of launching a "significant fund" to invest in the companies – and receive the business development support they need to take their business to the next level.

Canadians are good at many things and we need to celebrate that more, Dickinson says. I know she means there's much more at stake than the "nice" complex Canadians are known for. It's about fostering a culture of risk and innovation, and ultimately, economic growth.

"It's critical that Canadians start to celebrate success," Dickinson says. "It might sound counterintuitive, but innovation begins by giving people the freedom to fail. As long as you learn from your mistakes, failure is actually a critical step in the entrepreneurial process."

You've invested in a number of food and beverage products. What attracted you to the industry?

At the end of the day, it's a field that's in constant demand because we all need to eat and drink, and because our population continues to grow. Nutrition, diet and preventative health are also becoming more and more important as our population gets older and as governments are struggling to finance our health care systems. I also saw a tremendous amount of upside from an investment perspective because of Canada's strong agricultural and manufacturing base and because our products are so trusted around the globe.

What are you working on now?

I'm in the process of opening an accelerator which is going to be focusing on helping early stage businesses in the food and beverage and health and wellness sectors. It's very exciting. I think it's really important to know the Prairies only get six per cent of the venture capital in the country, and I think in particular, this sector gets even less. Food and beverage are so important to our health and wellness that I want to make sure that I can help those companies go and succeed and build into successful, hopefully global, companies.

Dickinson describes the accelerator as a community for driven entrepreneurs where they can network, access strategic investors and receive the business development support they need to take their business to the next level.

WE'RE STARTING TO SEE A LOT OF RETAILERS FOCUSING ON REGIONAL SPECIALITY PRODUCTS.

NOT EVERY STORE WILL CARRY THE EXACT SAME THING.

I THINK THAT'S A GROWING TREND IN RETAIL AND IT'S AN INTERESTING OPPORTUNITY TO PROVIDE AND TEST PRODUCTS IN-STORE IN SOME CASES BEFORE IT GOES TO A LARGER DISTRIBUTION CHAIN.

Do you already have people lined up for it?

We've got a list of candidates who've applied to enter the accelerator and have reached out to us. Our selection criteria is similar to the due diligence process I do when I'm investing in a company. They need to be a good fit not only in terms of their industry and revenues, but they need to be a good cultural fit. By that I mean, driven entrepreneurs who will be able to contribute to the community by way of their experience. We've had applications from across the country and we're very excited about putting together a good group who can learn from each other, and benefit from the services and support of the accelerator.

Are you partnering with anyone on the accelerator?

I have a number of corporate sponsorships that I'm tremendously excited to announce. They're going to be central to delivering programming, creating networking opportunities, and contributing to the professionalization of our participating companies. Stay tuned.

Are we going to be seeing more of it? Perhaps on TV?

I have a couple ideas in the works for a TV show, but my priority right now is getting the accelerator up and running and providing our participating companies with an environment that will energize growth and innovation.

Where do companies need most of their help?

It really depends on the stage. We're looking for the companies in the $1- to $5-million revenue stage already; they've started to get some traction. There's a variety of different areas, but I think at that stage you generally need help in terms of structure, marketing and distribution support. You need to be able to get your product into the market; you need to help make sure people understand that marketing is a very key element that I think gets overlooked sometimes with many accelerators and in *Dragon's Den*, that's the number one thing people said they wanted to use funds for. We learned over time, and really we all know this, that without true support, a true foundation of marketing and distribution, we really can't get on the shelves and off the shelves. It's a combination of all of these things.

We've come to know you a lot from your time on *Dragon's Den* and I think your values come through clearly when you speak and invest. Do they guide every investment you make?

Absolutely. When you're making investments, it's not just an exchange of capital for equity; you're signing up to partner with somebody. You need understand what each party will bring to the table and you need to agree on the goals and vision for the company. Sometimes a relationship in business fails because the expectations aren't set correctly. The foundation of every business relationship for me is starting off with mutual values and a mutual vision.

> I think every product, in some way, needs to be represented online at some point. I don't think you can avoid the need that people have to get information about your product.

Is there anything else that guides your investment decisions, even in terms of who would come into the accelerator?

The accelerator is a unique situation. Obviously we're looking for strong companies – companies that have demonstrated a track record of success and creative thinking – but we also want entrepreneurs who are going to contribute to the culture, which is one of collaboration, hard work, and innovation. It's about getting people who want to work together and learn from each other. Collaborating with your peers – other entrepreneurs – is just as important as getting mentorship from entrepreneurs. A business needs a range of ingredients to succeed.

Did anyone mentor you in the food and beverage business along the way?

Because I've invested in this space a few times, I've had the opportunity to sit with successful entrepreneurs and learn about the industry. From the future of manufacturing to distribution, I've been a student of the industry for the past decade. I've been fortunate that so many people have taken the time to talk to me about the opportunities and challenges.

Share with us what you think some of the challenges and opportunities are in this sector.

Obviously, marketing and distribution. Distribution is key. You have to get your product out whether it's through Shopify or some of the digital retail experiences out there, or whether it's a physical experience in a bricks and mortar location, or whether it's a delivery experience. No matter what you're doing, you have to get the product into the hands of consumers and the only way to do that is to find distribution channels that are going to reach your specific consumer. That's very difficult to do, especially as you're growing, if you're a niche product or a specialty product. I actually think niche and speciality products are getting a day in the sun here because that issue is becoming more and more important: the idea of where a product is from. And as that happens, small batch, artisanal, and craft is very appealing. It's getting distribution but it's also marketing so that people want to purchase your product.

Do companies need to be online or does it depend on the product and the customer?

I think every product, in some way, needs to be represented online at some point. I don't think you can avoid, nor should you be, the need that people have to get information about your product. Even if all you post is information on your product, you need to be open and transparent to your consumer. It can be as simple as putting the product on one page so that people can understand more about it to something as complex as mass distribution and telling people where to buy it at retail. You definitely need to have a presence online.

Is marketing in this business unique or similar when compared to other industries?

I think consumer marketing – consumer goods, packaged goods marketing – is unique. In terms of marketing itself, each different product needs its own position and place but you do need to understand trends, what drives consumption behaviours, and what the patterns are regionally and nationally and internationally. Marketing at its basic is about strategy and understanding who your audience is and coming up with tactics to reach them. So yes, it's unique, as is everything you do in marketing.

Are there any areas that are changing?

One area is consumption behaviour. In North America, people are consuming differently, whether they're eating out because they're working more hours, or cooking at home because they want healthier alternatives. There's a heightened awareness among consumers of the quality and content of the food they're consuming. As a result, more and more people are buying local, buying fresh, buying artisan, buying organic.

You've been very supportive of natural, organic products but there's no universal standard as to what all this means. I think it's often misunderstood and mistrusted by the consumer and they do cost more. Is it a growth area or will it go away? What's the impact?

I think it's a growth area. As it attracts more consumers it will also attract more regulation but I hope the overall trend has a positive impact on the food and beverage sector. By that I mean, whether it's 100 per cent organic or not, my hope is that you'll start to see less chemicals and pesticides being used in the cultivation of the product.

Do you have a general view of where you see the Canadian consumer now in this sector?

We're starting to see a lot of retailers focusing on regional speciality products. Not every store will carry the exact same thing. I think that's a growing trend in retail and it's an interesting opportunity to provide and test products in-store in some cases before it goes to a larger distribution chain. I think Canadians love being outdoors and we connect with nature. I like to think we're a country that loves farmers and appreciates them because we're very rural as a nation as well. I would say that Canadians are becoming more and more aware and more thoughtful about food.

> You can't just have the best sauce in the world because your mom made it and think you're going to sell a million cases of it. It doesn't happen that way without an incredible amount of things lining up to get it where it needs to be.

If a food manufacturer client came to you, how would you help guide them in their business and provide expertise?

People come to me for different things; for marketing services or for investments. In these two areas, I'm able to help them think through marketing and sales strategy, and I have one of the best teams in the country to execute on those strategies. But I'm tremendously excited about the accelerator we're building as a tool to help businesses in this space. I've invested a lot of time and money to create a space for driven entrepreneurs to collaborate, network, find a strategic investor, and benefit from programming. At the end of the day, I'm investing in entrepreneurs and trying to build an entrepreneurial culture.

How do you give them advice in terms of fads and trends? How do we know if something has health and wellness staying power versus a fad? Look at gluten-free, for example.

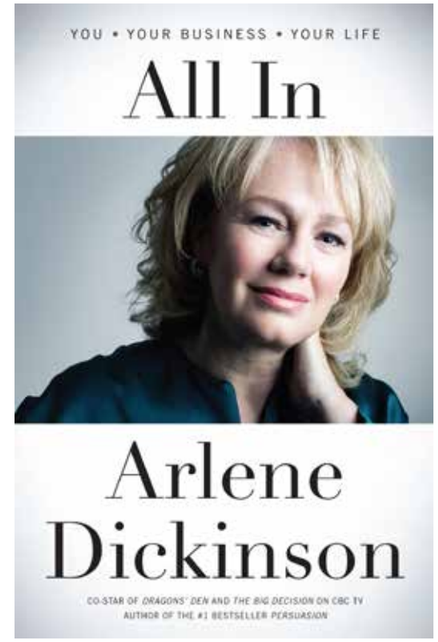
Predicting the future is difficult. I probably would have said four or five years ago that gluten-free was a fad and I would have been wrong. But when something starts to become engrained language and culture, when it becomes a social norm, it's likely transitioned past the fad stage and into the trend stage. So by that loose definition I think something like gluten-free is a trend.

You think it won't go away?

I think it will evolve. I think gluten might be the entry point into talking about all ingredients and how they impact your health, allergies and changing health patterns. It may be something else next, but its point is left behind.

What do people really need to know to get into the business?

It's the same things you need to get into any business. They need to know that they need to have more money, energy and passion than they believe. Nothing is different in the health and wellness business or the food business or the beverage business. It's going to take you a lot of energy. It's going to take you more time than you thought. Probably more energy than you expected. It's hard work. It's super rewarding and you have to persevere through and, in particular, you have the challenges that the food industry has, which is everything from health and safety through to consumer adoption through to distribution. There are some unique issues there. You've got to be ready for it. You can't just have the best sauce in the world because your mom made it and think you're going to sell a million cases of it. It doesn't happen that way without an incredible amount of things lining up to get it where it needs to be. It's not that you can't do it; it's just not easy to do.



Dickinson's second book deals with navigating the unique emotional and personal demands of entrepreneurship. Her first book, Persuasion, *was a bestseller.*

How is social media shaping the food and beverage environment?

Bloggers, people talking about your products, support from the different interest groups or market segments you speak to is critical. I think that social media is a sales tool as well as a communication tool. It's evolving. You can buy straight from Instagram, you can advertise and purchase through Twitter and Facebook and all of these things are evolving into sales platforms and it's important to understand how to best utilize it. Think about Pinterest for food. It's gigantic. I don't know if it's been converted yet into a place that people find en masse but I think it certainly will go there.

And it definitely needs to be managed.

Yes and it's not managed by your daughter or sister or cousin in the basement. It's managed by somebody who listens to and understands social environments and understands your brand. A dedicated person.

You work with Breakfast Club of Canada. Do you worry about people globally having enough food to eat?

Food is a basic human right. And the notion that there are children in Canada and around the world going to school without it is troubling to me. That's why I got involved with the Breakfast Club of Canada. Kids need to be fed well in order to be educated well. If our children are the drivers of Canada's future prosperity, we need to ensure they're receiving the tools they need to become the next generation of leaders.

You have said the opportunity to be a Dragon made some of your dreams come true. What were those dreams?

I'm very grateful for *Dragon's Den* because it gave me a chance to do things I just couldn't have done otherwise. It afforded me opportunity to meet entrepreneurs from every corner of the country. It reinforced my faith in Canadians. Their hard work and ingenuity never cease to amaze me. The investment side of the show made me a stronger businesswoman. It was an unexpected experience that left a mark on me as a businesswoman, a person, and a Canadian, and I'm grateful for that.

Aside from the accelerator, what else is next for you?

I'm in the process of launching a significant fund to invest in companies in the health and wellness and food and beverage spaces. This is a major thing. We've got to invest in these companies. We've got to provide growth capital to these types of organizations and innovative ideas.

> I've invested a lot of time and money to create a space for driven entrepreneurs to collaborate, network, find a strategic investor, and benefit from programming. At the end of the day, I'm investing in entrepreneurs and trying to build an entrepreneurial culture.

And grow them in Canada.

Yes, and grow them from Canada. It's exciting.

WARM WEATHER Beverage trends

Beverages underwent an overhaul this year bringing fresh flavour combinations and unique drink fusions in hopes to satisfy the 82% of U.S. consumers who are willing to try new flavours and the 97% of Canadians who spend portions of their leisure time out at restaurants. Here's a look at the major themes in non-alcoholic beverages:

Text by Bethany Wall

1 CONSUMERS CRAVE DESSERT AND COLD PRESSED COFFEES

Dessert coffees continue to grow in popularity as 55% of U.S. consumers seek out specialty items even when they know they are not healthy. In fact, the amount of specialty coffee consumed in North America is growing rapidly, with leading flavours including caramel, chocolate, and cinnamon. Retailers are adding dessert specialty coffees to their menus including salted caramel, flan, tiramisu, and ice cream-flavoured lattes.

Cold pressed coffee, including iced and cold-brew, is becoming increasingly popular among coffee drinkers despite the extensive brewing time required, appealing to the 52% of Canadian coffee drinkers who are prepared to take their time for coffee for an improved taste. Starbucks recently added cold-brewed coffee to its menu despite the fact that it requires a labour-intensive process. Meanwhile, Dunkin' Donuts added new Coolatta Lite flavours appealing to the 49% of U.S. consumers seeking lower calorie coffee with natural sweeteners. Chick-fil-A has partnered with Thrive Farmers Coffee, to offer a socially responsible iced coffee that is on point with the 21% of consumers that place ethical and health claims among the most important criteria when selecting a brand to visit.

2 CANE SUGAR IS IN; HIGH FRUCTOSE CORN SYRUP IS OUT

Another health-conscious move on the part of companies is to reintroduce sodas that contain cane sugar instead of artificial sugars. This provides alternative options for consumers that do not want high fructose corn syrup in their drinks. To this end, Jones Soda is offering custom-designed fountain machines for its unique flavours. Meanwhile, Umami Burger is partnering with PepsiCo to provide Pepsi products with "real sugar".

3 LEMONADES AND VEGETABLES AS A KEY INGREDIENT

With warmer weather here, lemonades have hit the marketplace in full force. Operators like Chick-fil-A are taking lemonade a step further with unique fusions, combining it with soft serve ice cream to create Frosted Lemonades. The lemon beverage is available in regular and diet to appeal to the 26% of Canadians who do not drink juices because they taste too sweet and the 27% who don't drink juices because they contain too many calories. Similarly, Taco Bell and Snapple partnered to introduce Lemonade Freezes.

Vegetables are also making an appearance on drink menus as an ingredient in teas, smoothies and coffees. Verve Coffee Roaster introduced an espresso drink with carrot-pineapple juice. This type of combination may excite the 42% of U.S. consumers willing to try menu items with unusual ingredients. Smoothies with veggie ingredients continue be popular with consumers including Tropical Smoothie Café's Avocolada smoothie that contains avocado, spinach, kale and coconut.

4 COCONUT FINDS POPULARITY AS A NON-MILK SUBSTITUTE

In addition to veggies, the use of coconuts as an ingredient in beverages has been on the increase in recent months. This includes coconut-flavoured drinks, as well as non-dairy milk substitutes, especially for consumers with milk allergies. This should help satisfy the 17% of U.S. consumers that wish restaurants offered non-dairy milk products. Peet's Coffee & Tea introduced three coconut coffees; Gloria Jean's Coffee added Caramel Coconut Macadamia Latte; and Starbucks added coconut milk as an option in all beverages. Additionally, Back Yard Burgers added Coconut Cream Milkshakes which uses traditional ice cream but is flavoured with coconut syrup.

While seasonal trends bring excitement and reinvigorate the marketplace, there is still room for further innovation. One quarter of U.S. consumers place signature items among the most important criteria in brand selection and half of consumers wish they could get seasonal flavours year round. Differentiation with signature offerings using unique flavours, ingredients and fusions presents a huge opportunity for brands.

Bethany Wall is a Foodservice Analyst at Mintel

ICE CREAM INSIGHTS AND CONSUMER PERCEPTIONS

3 TRENDS IMPACTING NORTH AMERICA

Text by Lynn Dornblaser

The global ice cream market managed to muster a 3% increase in 2014. Global volume sales of ice cream climbed slightly faster (4%), reflecting the category's expansion in emerging markets. China has replaced the U.S. as the world's largest ice cream market, accounting for a third of all ice cream products sold in 2014, and becoming the powerhouse of the global market.

Meanwhile, global volume sales growth of ice cream mainly reflects the category's expansion in emerging markets. Growth has encountered challenging conditions in more developed markets, including competition from other categories (eg yogurt), growing consumer concerns around health and dieting, as well as the perennial challenge of unseasonable weather. The U.S. experienced no annual growth between 2013 and 2014, while the Chinese market saw a mere 8% growth and Russia 7% growth during the same time period. As the world economy's centre of gravity continues to shift away from the West, these challenges give ice cream giants all the more reason to extend their presence and new product development (NPD) investment in emerging economies, as well as pursue flavour inspirations to spur growth and reengage consumers.

North America's Ice Cream Bowl

Challenges continued to pose threats to the North American market as steady post-recession increases in new product innovation halted in 2014 with -24% NPD from 2013-2014. Further, North America accounted for only 15% of global retail ice cream and frozen dessert NPD trends from 2013-2014. All types and formats of new product launches were affected, especially dairy-based types and stick/bar formats. However, according to Mintel data, across most segments – including frozen 'novelty' treats, gelato, sherbet/sorbet/ices, frozen yogurt and ice cream – consumers say they are buying the same as last year. One segment where purchases have increased, however, is non-dairy frozen treats with nearly 45% of consumer saying they are buying more.

Despite potential challenges facing the ice cream market in 2015, we've identified three key emerging trends that will effect change across the industry, including:

1. Niche companies and products

- The market continues to fragment. While leading companies own the share of voice, the total number of companies increases making the market more crowded than ever.
- Currently, the U.S. is leading the way for launch activity in handcrafted ice creams, likely relating to the market's size and maturity.
- These products can offer innovation inspiration to other markets, specifically with regard to sourcing ingredients from local farmers and using packaging as a distinguishing selling point that celebrates – and appeals to – a sense of individuality.

2. Health concerns

- Claims on ice creams and frozen novelties focus on "absence of negatives". The most prevalent per cent change in claims from 2013 to 2014 include GMO-free (35% increase), hormone-free (nearly 25% increase), no additives/preservatives (20% increase), and low/no/reduced calorie (nearly 20% increase). Organic, seasonal and slimming claims all decreased between 2013 and 2014.
- Overwhelmingly, consumers claim to be buying less ice cream/treats because they are unhealthy, as opposed to too expensive.
- While health attributes are importance, they are not essential for a third (33%) of consumers.
- Still, companies are offering consumers more "better for you" options in the way of Greek yogurt options, smaller portion sizes, and better ingredients including vegetables, oats, soy and dairy free.

3. Flavours and formats

- The most common retail purchase driver for ice cream/treats in the U.S. is flavour (nearly 70%).
- Latest flavour innovations are taking a page out of confectionary's playbook and combining sweet with salty, including salted caramel and salted vanilla flavour combinations. In an attempt to attract the more sophisticated palates of some adults, brands are incorporating everything from bitter fruits and vegetables, to cheese and alcohol, creating signature flavours.

The ice cream market continues to feel the heat from consumers to provide better-for-you options, but the category is responding in a range of ways to meet this demand. Flavour drives consumers purchase across the category, creating the biggest opportunity for innovation. And finally, brands are looking to some of the smallest companies for the greatest innovation. We may see larger firms adopting those ideas in the seasons to come.

Lynn Dornblaser is Director, Innovation & Insight at Mintel

PROTEIN DETERMINATION

Text by William Ickes

Top: The BUCHI NIRMaster, with IP54 ingress protection and rugged design for immediate analysis of protein and other critical sample properties on the production floor.
Bottom: BUCHI Automated Kjeldahl solutions featuring the KjelMaster K-375, the most automated Kjeldahl system on the market today.

Due to its critical role in diet and health, measuring the protein content of food is more important than ever. Food production companies need to monitor protein content at multiple points along the food process chain. The three most common techniques used to measure protein content are Kjeldahl, Dumas (combustion), and NIR (near-infrared spectroscopy). While all three are valid, each of these methods comes with unique advantages or challenges. BUCHI Corporation is unique in that we have expertise in all three of these techniques. This expertise can applied to help you decide which technique will best work for you.

The three major areas in the food production process chain include: raw material inspection, process control, and final analysis for label claim. As processed food, beverage, feed, and forage pass through the production lifecycle, different techniques may be considered to measure protein content. Whether you need fast qualification of raw material, or precise protein declaration of processed goods, the BUCHI protein solutions portfolio cover it all.

In the warehouse, where raw materials used in food production are initially screened and inspected, it is important to have a rapid and comprehensive analysis that can quickly give you an indication of the quality of the incoming raw material. Here you will commonly find techniques like NIR due to its rapid measurement, typically less than 20 seconds, and its ability to perform multicomponent analysis such as measuring protein, fat, moisture, ash, and many other components simultaneously.

In the production line, it is important to measure protein content and other components to ensure that the formulations meet specifications. Here, a rapid and comprehensive technique such as NIR should be considered. In addition to at-line sampling possibilities, an on-line NIR sensor can be integrated to a feeder, mixer, conveyor belt, or product pipe to provide rapid and continuous measurement results in-process. Measurements may be incorporated into a control system for real-time process adjustments. On-line control helps to ensure goods with consistent quality while maximizing production efficiency and profitability. BUCHI also has expertise in this technique with our NIR-Online solution.

In the R&D laboratory, you need a primary technique such as Kjeldahl for measuring protein so that you can accurately and reliably calibrate your NIR instrumentation. It is also used to help determine the protein content of unique formulations in which NIR calibrations have not been developed.

In the QC laboratory, it is important that your method for determining protein content is compliant with official regulations such AOAC, DIN, an ISO. In this environment Kjeldahl and Dumas combustion are commonly employed.

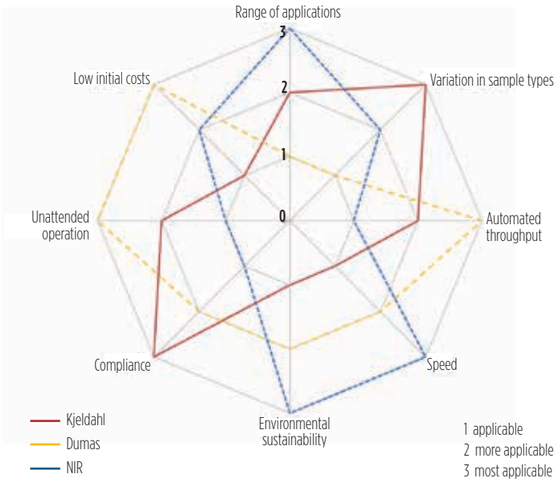
Now that we've taken a look at the different places in the process chain that require protein analysis, let's take a brief look at the different techniques and the factors that will determine which technique is best suited.

Kjeldahl is a well-established primary method for determining the protein content in all kinds of food products. It consists of digesting the sample in sulfuric acid and catalyst at a temperature of 420 C for approximately 90 minutes until all organic material is digested in the sample. The nitrogen contained in the amino acids of the protein are released from the sample matrix and converted to ammonium sulfate. Following digestion, the sample digestion mixture is diluted with deionized water before being placed on a steam distillation system. Strong base in the form of sodium hydroxide is added to the sample mixture in excess to completely alkalize the sample and liberate ammonia gas. The ammonia gas is steam distilled into a receiving solution consisting of boric acid solution. When the ammonia reacts with the boric acid solution it forms an ammonium borate complex which raises the pH of the receiving solution. The receiving solution is then titrated to the original pH of the boric acid solution with standardized sulfuric or hydrochloric acid. If the sample weight and milliliters titrated for the sample is known, you can calculate the nitrogen content which is then converted to protein content with a correction factor.

Dumas combustion is a method for determining protein content in various food products. It consists of combusting the sample at a high temperature of 910 C in the presence of oxygen to convert all the organic components of the sample into gases. Many gases are generated in this process; all except the nitrogen and carrier gas, which in this case is CO^2, are removed at different stages within the instrumentation. In the final stages, nitrogen and carrier gas is analyzed by a thermal conductivity detector. The system then converts the conductivity response to nitrogen content based on a calibration with reference materials of known nitrogen content.

NIR is a method for determining protein content and various other parameters in many products. It is a spectroscopic method in which the sample is illuminated by light from the near-infrared region of the electromagnetic spectrum. The light is absorbed, scattered or reflected by the sample based on its composition (e.g. protein, moisture, fat). The resulting signal, or spectra, may then be correlated to the sample's identity, or quantitative parameters, such as protein content, that have been determined from a primary analysis such as Kjeldahl. Once a calibration curve is generated, the composition of routine "unknown" samples may be measured.

Now that we understand each technique, we can see which technique is better suited for the different tasks. The spider graph



below represents different considerations for each technique and correlates which technique is best suited to accomplish project goals while considering limited resources.

In conclusion, Kjeldahl is a technique that can handle all kinds of sample matrices and has the most official methods out of the three techniques. It can be very automated and has a portfolio range that can fit most budgets. It is most commonly found in the R&D and QC label claim laboratories.

Dumas is a technique which can handle homogenous, protein-rich samples in both the solid and liquid form. It has a significant number of official methods and is commonly used in the QC setting. The strength of the Dumas combustion technique is that it has a fast four-minute analysis time and does not require hazardous chemicals. If you need to quickly re-analyze a questionable sample, Dumas can do this quickly.

NIR is a technique that can handle all kinds of samples. It is the fastest technique with an analysis time of less than one minute and has the added value of being able to perform multicomponent analysis. It does require upfront calibration development unless a global calibration solution already exists, but the potential return on investment is enormous once the calibrations are implemented. Moreover, it is the only technique of the three that can detect adulterants.

No matter what your needs are for measuring protein content, BUCHI has a solution for you. If you would like to find out more about our Kjeldahl, Dumas, or NIR solutions for food analysis, please contact us at www.buchi.com/us or call (302) 652-3000.

William Ickes is the Kjeldahl and Dumas Product Manager for BUCHI Corporation

SENSUS'S STAR INGREDIENT PROVIDES A SOLUTION TO MANY CONSUMER HEALTH CONCERNS

Inspired By Inulin

Text by Hermione Wilson

Growing consumer concerns about artificial ingredients and additives have led to unprecedented action on the part of major food processors. There was a cascade of announcements early this year from one food manufacturer and restaurant chain after another as they moved to voluntarily remove artificial ingredients from their products.

In March, McDonald's vowed to start sourcing only chickens that had been raised antibiotic-free. Kraft Canada declared in April that its iconic macaroni and cheese would be free of artificial preservatives and synthetic colours by 2016. PepsiCo announced it would be replacing aspartame with a mixture of sucralose and acesulfame potassium in its Diet Pepsi drink come August, citing aspartame as the number one reason consumers were opting not to drink the diet soda. In May, Panera Bread published a "No No List" of artificial ingredients and additives it would be removing from its bakery-cafe fare, joining the ranks of companies like Nestlé and Dunkin' Donuts.

Make inulin work for you

Brownie Comparison

Reference

Nutrition Facts
Serving Size (30g)
Servings Per Container

Amount Per Serving
Calories 120 Calories from Fat 45

Total Fat 5g	**8%**
Saturated Fat 1g	**6%**
Cholesterol 15mg	**5%**
Sodium 100mg	**4%**
Total Carbohydrate 18g	**6%**
Dietary fiber less than 1g	**3%**
Sugars 12g	
Protein 2g	

Vitamin A 2% • Vitamin C 0%
Calcium 2% • Iron 2%

Frutalose® SF75

Nutrition Facts
Serving Size (30g)
Servings Per Container

Amount Per Serving
Calories 100 Calories from Fat 35

Total Fat 4g	**6%**
Saturated Fat 1g	**4%**
Cholesterol 15mg	**5%**
Sodium 100mg	**4%**
Total Carbohydrate 18g	**6%**
Dietary fiber 3g	**11%**
Sugars 9g	
Protein 2g	

Vitamin A 2% • Vitamin C 0%
Calcium 0% • Iron 2%

Nutrition Comparison

16% LESS ENERGY, 20% LESS TOTAL FAT, 25% LESS SUGAR AND 3G MORE FIBRE

The increasing demand for healthier ingredients has food processors turning to ingredient suppliers for solutions, and Sensus is well placed to respond. The multinational natural ingredient company offers a complete line of sugar-replacing, fibre-enhancing ingredients, and the secret weapon is inulin.

Inulin is a soluble dietary fibre found in a number of roots and vegetables, but it is found in a particularly high concentration in chicory root. This is where Sensus sources its inulin, which it refers to as chicory root fibre. Not only does inulin have all of the digestive health benefits of other insoluble fibres, it is also a prebiotic.

Replacing sugar with chicory root fibre in a product is fairly simple, allowing for the fact that the sweetness flavour profile will then have to be adjusted to taste.
– Carl Volz, President, Sensus America

"[Chicory root fibre] stimulates the growth of good bacteria in the digestive tract," says Carl Volz, President, Sensus America. "That's really important for good health. When you have a healthy gut, your body is producing short-chain fatty acids that are important for your immune system. It's also producing vitamins that your body needs, plus you get all the other benefits of fibre."

But the most exciting thing about inulin, at least for the food industry, is the fact that it has the potential to replace sugar on a one to one basis.

"We are the innovators in chicory root fibre and we have the sweetest fibres in the marketplace," Volz says. Sensus's sweetest product, Frutalose SF75, is 75 per cent fibre and 65 per cent as sweet as sugar.

Replacing sugar with chicory root fibre in a product is fairly simple, Volz says, allowing for the fact that the sweetness flavour profile will then have to be adjusted to taste. "If the formula calls for one pound of sugar, you can replace it with one pound of chicory root fibre, so it's an easy and straightforward switch in a lot of food and beverage products," he says. Despite its sweet taste, the fibre also has a low glycemic index.

Sensus's inulin products also have the potential to raise the health profile of food products with their high fibre content. "There's a significant fibre gap in the diets of the great majority of people in Canada and the United States," Volz says. "Our liquid stable inulin syrup and our inulin powders help address that, along with sugar and calorie reduction."

Chicory root fibre is easier to add to food and beverage products without dramatically changing texture and taste. "Chicory root fibre is a soluble fibre, so it goes into solutions clear, and that means it can go into food and beverage products very, very easily," Volz says. "It's not imparting any negative taste and texture, where insoluble fibres, like bran, can."

It is the distinctive taste of fibre-rich products like bread and bran that often turn consumers off fibre, says Volz. Consumers also traditionally connect high-fibre food products with the less-than-glamorous perks of digestive health benefits like "transit time and regularity," he says. "The challenge for us is to help the consumer to understand that products that have high fibre can still taste great," Volz says.

"Canadians are ahead of the curve in terms of dietary fibre, prebiotic fibre, and other nutritional additives," says Rob Kowal, President of Kriscor and Associates, Sensus's representative in the Canadian marketplace. "They are more attuned to gut health."

Sensus collaborates with Kriscor on how to approach potential Canadian clients, and exchanges technical and application information, along with consumer data that Sensus generates in-house.

"I keep Sensus abreast of what's changing in Canada and what the food and beverage environment is like," Kowal says. "It's a very transparent, open relationship."

Sensus's inulin products have been well-received by the Canadian food and beverage industry, he says. "The attributes that interest customers varies on the application," Kowal says. "Some use inulin as a way to add natural fibre, some to reduce sugar." Inulin has found its way into a variety of Canadian products, such as cereal, energy bars, cookies, bread, yogurt and fibre supplements, Kowal says.

"[Chicory root fibre] is pure, it's clean, it's simple, it's natural, it's non-GMO," Volz says. That's an important message to be able to tell the modern consumer, who is increasingly concerned about the content and nutritional value of their food. ■

Regulatory Arena

PART 2 OF 4

A Look Across the Border – U.S. and Canadian Treatment of "Clean Labels"

Sara Zborovski

Welcome back to the Regulatory Arena and the second edition on the Clean Label. In our last installment, we introduced and explored the definition and set the stage for upcoming discussions. In this issue, we consider some of the differences in the treatment of the clean label in Canada and the U.S.

As we all know, the food industry is global and as a result, manufacturers need to consider multiple regulatory requirements, cultures and litigation risks when formulating and in marketing strategies. Given the popularity of the clean label among consumers, and the regulatory guidance (or lack thereof) offered by Health Canada and the FDA, preparing clean label foods for the two markets can be tricky. Throw in an active U.S. plaintiff bar and things can get downright scary.

Using the "natural" claim as an example, in this edition of the Regulatory Arena we highlight some of the key differences in the impact of the clean label trend on manufacturers in the two jurisdictions.

But first… a quick update on the *Safe Food for Canadians Act:* in April, the CFIA announced that it is seeking feedback from micro and small businesses on options that could reduce the burden associated with some of the requirements being considered in connection with the Regulations under the SFCA. This consultation is open until June 30. In addition, a draft summary of proposed regulatory texts and an overview of the Agency's progress-to-date was released.

WHAT IS "NATURAL" IN CANADA AND THE U.S.

In the last edition of the Regulatory Arena we noted some of the key hot topics most often associated with the clean labelling movement. Among other things, today's clean label consumers are particularly interested in products that are "all natural".

"Natural" is not defined by regulation in either Canada or the U.S. The CFIA has advised that, at a minimum, it expects food represented as natural to have nothing added (no added vitamins, minerals, artificial flavours or additives), nothing subtracted (other than water – that's OK) and be made by nature (no process that has significantly altered the food's original physical, chemical or biological state). Obviously, this doesn't answer all of our questions about what is "natural", but it certainly gets us at least part of the way.

In answer to the question, "What is the meaning of 'natural' on the label of food?" the FDA stated:

From a food science perspective, it is difficult to define a food product that is 'natural' because the food has probably been processed and is no longer the product of the earth. That said, FDA has not developed a definition for use of the term natural or its derivatives. However, the agency has not objected to the use of the term ***if the food does not contain added color, artificial flavors, or synthetic substances.***

Thus, the FDA has given similar guidance as the CFIA, while not addressing the nothing subtracted, and made by nature elements of the Canadian position.

Interestingly, as early as the mid-1970s, the Federal Trade Commission (FTC) attempted to define "natural". It gave up in 1983, concluding that it was unable to establish a definition given the wide variety of products and industries involved in food production, and the varying expectations of consumers in connection with (by way of example) a natural apple vs. natural ice cream. The FTC has not attempted to address the issue in connection with food again.

BRANDER BEWARE…

It seems as though new class actions are commenced weekly or even daily in the U.S. against food manufacturers for clean label claims. Despite the fact that few of these cases are actually being heard in court, they are getting big press and big settlement payments from industry to consumers.

By way of example, Kellogg's recently paid $5 million into a settlement fund and agreed to remove "all natural" from its Kashi product labels. The litigation arose because of the alleged inclusion of ingredients like pyridoxine, hydrochloride (vitamin B6), calcium pantothenate (vitamin B5), ascorbic acid and calcium phosphate (among others) in products labelled "all natural". By way of another example, an "all natural" class action against Dole asserted that it was misleading to label fruit products containing citric acid and ascorbic acid as all natural.

The U.S. courts are being asked to weigh in on questions like: can products made from a natural process, but containing man-made additives be accurately labeled as "natural"? In Canada, based on the CFIA's position as set out above, the answer would be no. In the U.S., without guidance from the FDA and/or the courts (i.e. because most cases are settled), the answer is a resounding "huh????"

Meanwhile, companies continue to fuel consumer demand for clean labels, labelling foods as "natural" without any real understanding of what the term means. The result: great uncertainty for industry and a "crossing fingers" approach to branding. For more information on U.S. litigation around "all natural" labels, and for a discussion of attempts made by the U.S. courts to have the FDA define the term, check out this publication by one of my partners, Stefanie Fogel, Co-chair of the DLA Piper Food and Beverage group in the U.S.

"Natural" is not defined by regulation. The CFIA has advised that, at a minimum, it expects food represented as natural to have nothing added, nothing subtracted, and be made by nature.

BUT WHAT ABOUT CANADA?

It goes without saying that the litigation we're seeing in the U.S. has not made its way to Canada in quite the same way, perhaps because of the greater clarity provided by our regulator, perhaps because of our less-active plaintiffs' bar. However, we are starting to see some "copycat" litigation, highlighting the fact that we are far from immune from clean label-based class actions.

Thus, Canadian manufactures need to tread carefully in responding to consumer demand for clean labels. Remember that the *Food and Drugs Act* prohibits labeling or advertising a food in a manner that is false, misleading or deceptive, or is likely to create an erroneous impression regarding its character, value, quantity, composition, merit or safety.

No matter how far consumers push industry, regulatory requirements must still be met. At least in Canada we have a bit of a better sense of what those requirements may be.

Fat: The Good, the Bad, and the Tasty

Alexia I. Blake | Alejandro G. Marangoni*

Over the last 20 years, consumers have developed a love-hate relationship with fat. While fat is responsible for the textures and tastes of our favourite foods, such as ice cream, butter, and baked goods, its prevalence in today's energy-dense diets has caused a drastic increase in obesity rates and cardiovascular disease observed worldwide[1-3]. Scientific evidence has shown that trans fats have particularly detrimental health effects, as they raise low density lipoprotein serum levels (i.e. bad cholesterol), and decrease high density lipoprotein serum levels (i.e. good cholesterol), which increases the risk of developing metabolic and cardiovascular diseases[4-8].

Small amounts of trans fats are naturally present in animal and dairy products, such as milk, meat, and cheese[9]. Trans fats can also be industrially produced during a process known as hydrogenation[10]. During this process, hydrogen gas is added to oil, to convert it from a viscous and non-elastic liquid at room temperature into a viscoelastic semi-solid fat. Hydrogenated oils are added to snack foods (crackers, microwaveable popcorn, pizza), baked goods (cookies, donuts, cakes, pies), refrigerated dough, vegetable shortening, margarines, and stick spreads, to enhance their taste, texture, and shelf-life[11].

Denmark was the first to respond to the diet-related health crisis in 2003 by restricting the amount of trans fat present in fats and oil to 2% (w/w) (Danish Order N. 160, March 2003). A decade later, the United States' Food and Drug Administration (FDA) released a preliminary determination that partially hydrogenated oils (PHOs), which are the main dietary source of artificial trans fats, should no longer be labeled as "generally recognized as safe" (GRAS)12. Without GRAS status, food manufacturers must seek approval for their use as food additives.

Canada has been much slower to adopt a stance on the issue, despite recommendations from the Trans Fat Task Force (TFTF), a collaborative initiative between Health Canada and the Heart and Stroke Foundation, to regulate the use of trans fats in foods[9]. In 2007, Minister of Health, Tony Clement, threatened food manufacturers with regulation if trans fats were not reduced to 2% of the total fat content of vegetable oils and spreadable margarines, and to 5% of the total fat content of other foods available for purchase within two years, as recommended by the TFTF based on the World Health Organization's recommendation that average daily trans fat consumption for all age groups does not exceed 1% of energy intake[1,9]. The Trans Fat Monitoring Program revealed in their final report, published in December 2009, that many food products still contained dangerous levels of trans fats, such as cookies, desserts, bakery products, and french fries[13]. Despite this failure, legislation was not introduced.

Fortunately, under the pressure of domestic legislation and evolving consumer demands, some food manufacturers have already begun to reformulate their products. Simply removing PHOs is not an option due to the contribution that fat provides to the structure, taste, texture, and mouthfeel of the product. Thus, food manufacturers must replace these fats with a material that mimics the behaviour of fat so that the quality of the food product does not suffer.

IN SEARCH OF FAT ALTERNATIVES

Fat is a surprisingly complex system that is difficult to mimic. Despite appearing solid to the naked eye, fat actually contains a considerable amount of liquid oil. This oil is entrapped by a network of fat crystal clusters[14, 15]. The clusters are aggregates of fat crystal nanoplatelets (CNPs) that are composed of fat molecules, also known as triacylglycerol (TAG) molecules, that stack tail to tail into a lamellar structure.

Depending on the solid fat content, crystal shape, size, and distribution, the functional properties of the fat (melting behaviour, texture, spreadability, flavour) will change[15-17]. This tunable behaviour is difficult to replicate, and complicates the development of equally versatile and functional replacements.

One strategy involves replacing PHOs with other hardstock fats, such as palm oil, palm kernel oil, and coconut oil[18]. This has created controversy for several reasons. First, these fats contain very high amounts of saturated fat, which has disputed effects on cardiovascular health[4, 19-21]. Secondly, the production of these tropical fats has devastating environmental effects, which will only worsen if demand increases[22-26]. Using locally available oils would result in environmentally-friendly sustainable practices, while also promoting the growth of the Canadian agriculture industry.

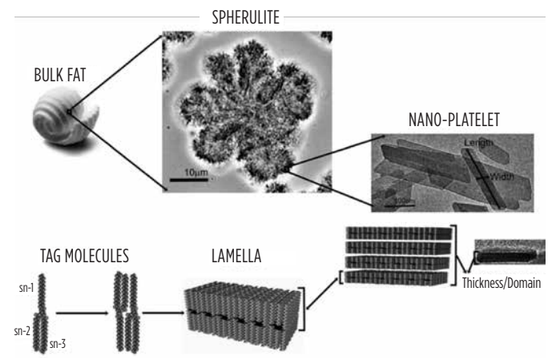


Figure 1. The Fat Structural Hierarchy. TAG molecules self-assemble into crystalline lamellae that aggregate into nanoplatelets, which further aggregate into larger crystals (spherulites).[14]

A more recent and novel strategy involves replacing the fat crystal network with another network that also structures liquid oil into a semi-solid material that resembles fat. Liquid oil is a more nutritious alternative since it contains very low to zero levels of trans fatty acids, and low amounts of saturates compared to solid fat. In addition, gelled oil may contain high levels of mono-unsaturated and poly-unsaturated oils, which studies have shown to have many positive health benefits[5,7,9,20]. Moreover, "locally-grown" oils can be used, such as canola oil or soybean oil. Oil structuring can be achieved using two main mechanisms, discussed below.

OLEOGELS

The first method of structuring oil is gelation. This is achieved by adding one of several gelator species to oil at concentrations below 4% (w/w)[17, 27-29]. The oil-gelator mix is heated to above the melting temperature of the gelator to disperse the gelator molecules. Upon cooling, these molecules crystallize and form a three-dimensional network that entraps the oil, producing an oleogel. These gels exhibit solid-like behaviour despite containing at least 96% (w/w) liquid oil. Apart from displaying tunable solid-like behaviour that is similar to fat, gelators must also be food grade, be priced realistically, and be available in relatively high amounts. These species can be classified as small molecular or polymer gelators.

SMALL MOLECULE GELATORS

The building blocks of these oleogels are low molecular-weight organogelators (LMOGs). They self-assemble during crystallization into a three-dimensional network that entraps liquid oil. If LMOGs assemble into a crystalline fiber, their network is referred to as a self-assembled fibrillar network (SAFiN).

Bot and Floter reported that mixtures of phytosterols and oryzanol form SAFiNS in oil[29-31]. Phytosterols are present in plant membranes at low concentrations (< 1 %), and improve cardiovascular health by lowering low-density lipoprotein serum levels[32]. Oryzanol is a sterol derivative formed by interesterifying sterols with vegetable oil[31]. Of the many sterol derivatives, including dihydrocholesterol, cholestanol, and stigmasterol, mixtures of β-sitosterol and γ-oryzanol are the most efficient oil structuring species. However, gelation only occurs if both components are present.

When combined, these molecules self-assemble into tubules that are approximately 7 nm in diameter[27, 31]. At concentrations between 2-4% (w/w), tubules aggregate into a three-dimensional network that entraps the oil and produces an oleogel. The gels are translucent, meaning that the tubules are smaller than the wavelength of visible light. Gels prepared with a 1:1 molar ratio of the two species exhibit the highest melting temperature and firmness. Changing the molar ratios, the type of sterol, and the type of oil used during esterification to produce sterol esters, alters the mechanical and thermal properties of the gel.

Another group of small molecule gelators are plant-based waxes[33-36]. Rice bran (RBX), sunflower (SFX), candelilla (CLX), and carnauba (CRX) wax have received a considerable amount of attention over recent years due to their ability to gel liquid oil at concentrations as low as 1% (w/w). Since such a small amount of wax is required to achieve gelation, coupled with the fact that waxes such as RBX and SFX are abundant in nature and commercially available, the addition of wax should be inexpensive and impart little (if any) taste on the final food product. Waxes are already used in a variety of consumer products, including cosmetics, candy coatings, lubricants, and greases[37].

Rather than forming a three-dimensional and continuous network like β-sitosterol and γ-oryzanol mixtures, waxes form dispersions in oil. Their platelet-like crystals, ranging between 3-30 µm in diameter, are evenly distributed throughout the oil[38]. It has been suggested that these crystals gel up to 99% (w/w) liquid oil by entrapping it within the pores of the network, and by adsorbing the oil onto the surfaces of the crystals[33, 34, 38].

Like fat, wax oleogels are extremely versatile. Their firmness, melting behaviour, and oil binding capacity can be modified by changing the type and concentration of wax, and by altering the shape and size of the crystals using external processing conditions such as shear and non-isothermal cooling[34, 35, 39-41].

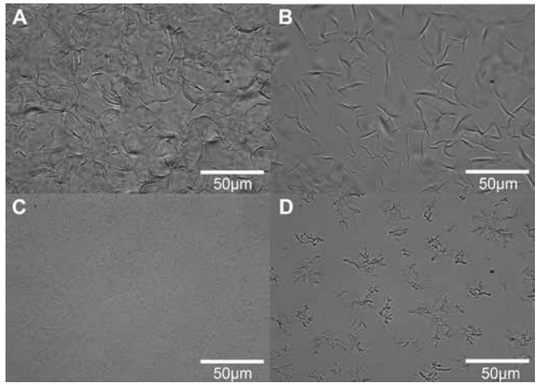


Figure 2. Brightfield light micrographs of wax oleogels consisting of canola oil and (A) 1 % (w/w) rice bran wax, (B) 1% (w/w) sunflower wax, (C) 2% (w/w) candelilla wax, and (D) 4 % (w/w) carnauba wax.

This flexibility is essential for adapting the functional properties of wax oleogels to be compatible with different food products.

POLYMER GELATORS

Dey et al. and Laredo et al. were the first to report the gelation of oil using ethyl cellulose (EC), which to date remains the only polymer capable of this feat[42, 43]. Gelation is achieved by heating > 4% (w/w) EC in oil to the glass transition temperature of the polymer (130 °C), causing polymer strands unfold and become mobile[44, 45]. During cooling, EC chains interact with other chains via hydrogen bonds to form a cross-linked network that entraps the surrounding oil phase[27, 45].

The mechanical properties of EC oleogels depend on the concentration and molecular weight of EC, and the type of oil used[44, 45]. Increasing the concentration or the molecular weight of the polymer produces firmer gels. The addition of surfactants has a plasticizing effect that lowers the glass transition temperature, meaning that gels can be prepared at lower temperatures. This prevents oil oxidation, which has been shown to increase gel firmness[46].

EC oleogels have been evaluated as fat replacements for frankfurter products, which often contain more than 20% fat[47]. Zetzl et al. reported that there was no difference in the chewiness or hardness of frankfurters made with canola oil EC oleogels compared to control frankfurter made with beef fat[45]. When only canola oil replaced the solid fat in frankfurter products, oil phase separation and undesirable changes in product chewiness and texture occurred, demonstrating the importance of structuring the oil[47]. Within the realm of confectionary products, EC has shown to provide heat resistance to chocolate[48].

The use of EC as a food additive is already permitted in Europe (Directive 2006/52/EC), but not in North America. This is unfortunate given the efficacy of this polymer as an oil binding agent. The ability to modify its mechanical properties makes it a very versatile oleogel that is likely compatible with a broad range of food applications, and thus a good fat alternative candidate. Hopefully, its use as a food additive in Europe will demonstrate both its safety and effectiveness to the FDA (and Health Canada), leading them to accept Dow Wolff Cellulosics application for GRAS status (GRN. No. 470).

STRUCTURED EMULSIONS

The second method of structuring liquid oil is by incorporating it into an emulsion. Emulsions contain at least two phases that are immiscible with each other, with one of the phases being dispersed as small droplets throughout the other[49]. Examples include mayonnaise, milk, and ice cream. Compared to traditional emulsions, a structured emulsion displays stronger solid-like behaviour that can be controlled by modifying the ratio of ingredients. One example are oil-in-water (o/w) emulsions that are structured by a hydrated monoglyceride bilayer.

Monoglycerides are among the most commonly used emulsifiers in the food industry, and are known to self-assemble into various configurations in both aqueous and non-aqueous mediums[50]. In this particular system, monoglyceride molecules self-assemble around oil droplets that are dispersed throughout a continuous aqueous phase and sandwich large volumes of water between layers[51-53]. The hydrated monoglyceride bilayers are stabilized by hydrogen bonding between adjacent monoglyceride molecules and by electrostatic repulsion between anionic co-surfactant molecules. During cooling, the monoglyceride chains crystallize and encapsulate oil droplets ranging between 1-6 µm in diameter. The final emulsion is a solid at room temperature, even though the monoglyceride is the only solid component and is present at concentrations between 3-6 % (w/w).

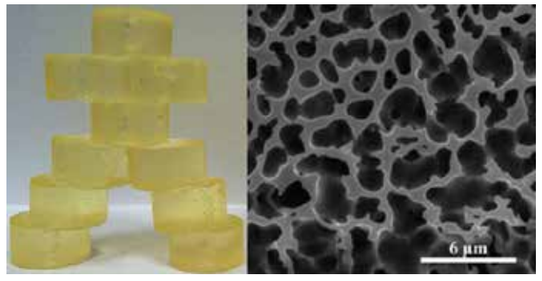


Figure 3. EC oleogels (left) and the polymer network (right) of a soybean oil organogel prepared with cP 45 ethyl cellulose. Oil has been removed by washing the gel with 2 mL of isobutanol[45].

This structured emulsion is a commercially available shortening alternative branded as Coasun™. This product is a healthier alternative to baking shortenings, as it contains zero trans and only 7-8 % saturates when the oil phase is comprised of canola oil[54]. Furthermore, the high water content of these systems, ranging between 30-40 % (w/w), reduces the caloric content by almost 40 % compared to other commercial shortening products[55]. Added benefits include the ability to encapsulate functional nutraceuticals (phytosterols or β-carotene), and the ability to tailor the nutritional profile of the oil phase by using poly-unsaturated and mono-unsaturated oils[52].

Coasun can be modified to act as a roll-in shortening replacement for puff pastry products. Roll-in shortenings are much harder and elastic compared to Coasun[56, 57]. However, by gelling the oil phase via the addition of wax, or by increasing the monoglyceride content, the mechanical properties of the emulsion can be adjusted to match those of a roll-in shortening.

With any emulsion system, there are concerns about stability and phase separation. The high water content of Coasun is indeed problematic in this respect, as condensation occurs during long-term storage or transportation under warmer temperatures, which may result in microbial growth. This can be mitigated by adding an antimicrobial agent, such as potassium sorbate, or by keeping this product at refrigeration temperatures for long term storage.

CONCLUDING REMARKS

Food manufacturers are beginning to limit the use of hydrogenated oils in food in response to changing consumer demands and legislation brought about by the known adverse health effects of trans fats. This has created a need for zero-trans fat replacements. The ability to structure edible oils into functional fat replacements that are free of trans fats, low in saturates, and also contain nutritionally beneficial or locally available oils is a very promising solution to this conundrum that, if adopted by food manufacturers, will lead to the development of healthier manufactured foods.

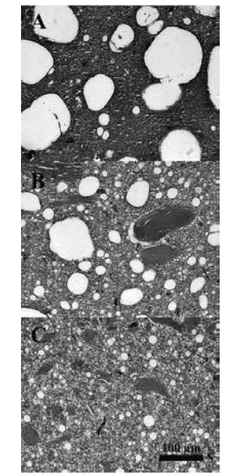


Figure 4. Micrographs of cooked comminuted meat batter containing (A) beef fat, (B) canola oil EC oleogels, and (C) canola oil. The white circular globules are fat globules (note: removed during the paraffin embedding process), while the dark surrounding area is the protein network in which some small intact muscle fibers still exist. The scale bar is 100um[45].

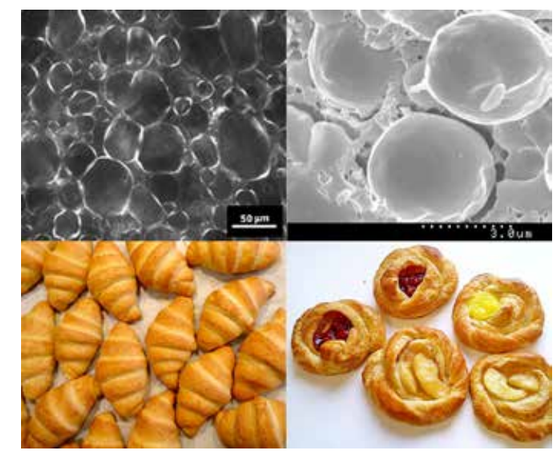


Figure 5. Optical light micrograph (top left) and cryogenic scanning electron micrograph (top right) of Coasun. When wax is added to the oil phase, Coasun can be used as a roll-in fat replacement for croissants (bottom left) and danishes (bottom right).

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Food Recall Strategies for Small Business

Cameron Prince

Recall! This is a word that can bring significant fear and concern for any food business. In particular, small companies who may not have the experience or systems to deal with recalls may find themselves in difficult circumstances in the event of a food safety issue and associated recall. Fortunately, significant food safety recalls are relatively rare. However, it is important for all food companies to devote the time and resources needed to ensure that their products are safe, properly labeled, traceable, and retrievable. The purpose of this article is to outline areas to focus on to be ready for a recall and to provide some information on what to expect in a recall scenario.

HAVE A STRONG FOOD SAFETY PROGRAM

Obviously, the best way to manage recalls is to never have one! Unfortunately, there is no such thing as a perfect food safety system. The best strategy is to have rigorous food safety programs in place including Good Manufacturing Practices and Hazard Analysis Critical Control Point (HACCP) based systems. Small companies may not have the capacity to achieve certification under one of the Global Food Safety Initiative (GFSI) programs. Fortunately, these programs are increasingly adapting to the needs of smaller businesses. Still, certification under a GFSI-based scheme is often not practical for smaller enterprises.

There are many options for more streamlined programs that are available to meet the food safety requirements of a small business. At a minimum, some staff should have current food safety and HACCP training, and a documented HACCP program should be in place. It is recommended that the food safety program be audited by an external expert or organization at least once a year. In some cases, regulatory inspections will serve this purpose but only if they are focused on a comprehensive HACCP-based system approach.

FOCUS ON AREAS OF FOOD SAFETY PROGRAMS THAT WILL HELP IN A RECALL

Although the totality of a food safety system will be the foundation for preparedness and management of a recall, there are three areas of every system that are particularly important to focus on from a recall point of view. They are: Traceabilty, Supplier Assurance, and Mock Recalls.

TRACEABILITY

Most food companies recognize not only the practical necessity of a product coding and tracking system, but also the regulatory obligations that are now in place and will likely be made more rigorous with the implementation of the Safe Foods for Canadians Act and Regulations. Production coding to the narrowest window of time that is practical, is the best approach. Often companies use production codes that cover an entire day's production. While this may be a simple and practical in most situations, it can lead to withdrawal of much more product than may be necessary if a recall were to occur.

It is also extremely important for companies to be able to trace back to the origins of all ingredients, packaging and labeling. Very often the cause of a recall is linked to problems with these inputs and not the company's production, storage or shipping processes. Having records of all ingredients, packaging and labeling and their use in production is essential to being able to establish a product withdrawal program during a recall.

Detailed distribution records are also critical. Normally this is not a problem area, but there are some sectors where deliveries are made on a just-in-time basis and orders are last minute, and hastily prepared. A company must know to 100% accuracy where products have been distributed to the first level beyond the plant or warehouse. Any amount of product that is unaccounted for, or even minimal errors in distribution records, can lead to all kinds of unforeseen problems during the intensity and pressure of a real-life recall situation.

Information systems for traceability have to be fast and reliable! The effective management of a recall hinges on being able to get correct information out to customers, consumers, and regulatory officials as quickly as possible. Delays bring questions and doubt. Incorrect information can lead to additional recalls for the same or similar products which can damage credibility and lengthen the time required to manage a recall. Getting it done fast and right the first time is the key to success. Whether it is an inventory software program, or in-house spreadsheets, or even paper-based records in small companies; these systems must be maintained and always functional and accessible, even when key company personnel are not available.

Testing the traceability system on a regular basis is required by all HACCP and food safety systems. There is often confusion between traceability exercises and mock recalls. The two are linked but a trace exercise is focused on accounting for all inputs, production, storage and distribution. It is primarily a product counting and verification process. Companies should test themselves on traceabilty - inventory, input use, and distribution, several times a year. Experience has shown that errors are often uncovered and systems become much better on each testing.

MOCK RECALLS

Mock recalls are a great tool to help prepare for the real thing. Unfortunately, these exercises are either overlooked or undervalued by many companies. Unlike traceability exercises, the goal of a mock recall is to test everything in the company's system including such things as communications strategies for the media and consumers, product withdrawal procedures, verification of withdrawal from the marketplace, alternative sourcing of products, notifying and managing customers affected, and working with regulators who will be demanding information and directly involved. The mock recall is an opportunity to develop scenarios that truly test the whole system. It is best to keep in mind that recalls always seem to happen at the worst times. Conducting some mock recalls outside of regular work areas is a good idea.

SUPPLER ASSURANCE

One of the most frustrating and difficult scenarios for recall happens when the cause of the recall is an ingredient or packaging. These inputs are purchased with the expectation that they are safe and of good quality, but mistakes happen and these can have major implications for companies using these unsafe or defective input materials. It is worth spending the extra time and diligence to ensure that everything received and used in a food product comes from a reliable supplier. Wherever possible, letters of guarantee, certificates of analysis, or evidence of the integrity and status of the supplier's food safety systems should be sought, reviewed, and kept on file. Establishing and abiding by an approved supplier list is often an easy thing to do for a small business and can greatly reduce the likelihood of food safety issues leading to a recall.

WHAT TO EXPECT WHEN YOU HAVE A RECALL

Getting the news that there is a problem with a product and finding out it has already been distributed to the retail/consumer level can create chaos if a company is not well prepared. Having an established plan and trained people in place will go a long way to ensuring that good decisions are made, and actions taken that make the process as orderly and effective as possible. After assembling the Recall Team, the first step in a recall response is to contact CFIA, and key customers who may have the implicated product. The team should also begin immediate work to define the identity and locations of products and develop the detailed logistics of product retrieval or disposition.

REGULATORY ASPECTS OF FOOD RECALL

Under existing federal regulations, companies must report food safety incidents and make records available to government inspectors. There are time limits for providing information and quality standards for these records. They must be well organized, complete, and if electronic, in a readily accessible format. Under the new regulations that will be proposed under the Safe Food for Canadians Act, it can be expected that standards for records and their availability will be made more rigorous. It is important to recognize that recalls in Canada are almost always done voluntarily by the affected company. There is a provision in federal legislation that allows for the Minister responsible for the Canadian Food Inspection Agency to order a mandatory recall, but this is seldom done because companies normally take responsibility and execute measures necessary to withdraw product from the market place.

WHAT WILL CFIA DO IN A RECALL?

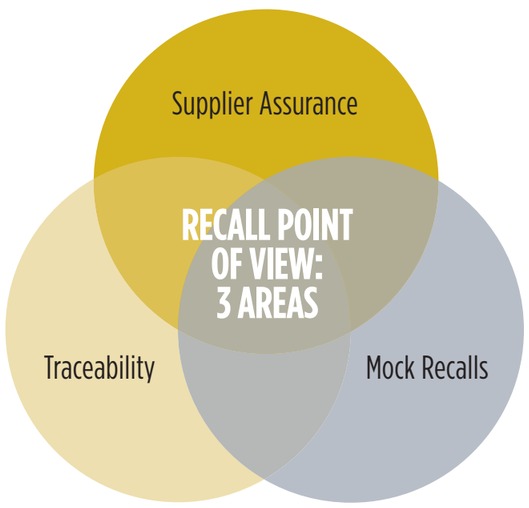
CFIA has a network of recall specialists across Canada with a centralized Office of Food Safety and Recall in Ottawa (OFSR). The first contact for most companies will be to a CFIA Area Food Recall Coordinator. Basic information will be collected initially and the file will be reported to OFSR. An investigation will be initiated to get enough information for a decision on a recall. Companies can expect to be asked for many types of information i.e. production and distribution records, product sampling and analysis, CCP monitoring, internal inspections, supplier records etc. Company owners or employees working with CFIA need to be as open, responsive, and co-operative as possible. The food safety investigators' focus will be strictly on food safety and limiting risk to consumers and they will require complete information as quickly as possible.

After the required information has been gathered, the OFSR will contact Health Canada who will make a final decision (Health Risk Assessment) on whether a recall is needed; and also the scope and category of the recall (Note: CFIA's website provides details on recall categories: inspection.gc.ca – go to Recall Plans Manufacturers Guide). CFIA is the operational organization responsible for ensuring that the recall is conducted

by the affected company. Note: In cases where product has been distributed to the U.S. or other countries, companies need to contact appropriate regulatory agencies in these jurisdictions. CFIA will work closely with U.S. or other country authorities to share information and coordinate recalls.

In cases where a food borne illness outbreak occurs, public health officials will lead the investigation and management of human health issues. The Public Health Agency of Canada leads where illnesses have occurred in more than one province. A localized food- borne outbreak is investigated by provincial or municipal public health officials. Although public health inspectors are not normally directly involved in the recall process itself, their investigations provide key information to the CFIA recall process.

There are three categories of recalls based on level of risk to human health. These categories determine key actions required, including whether or not there is a need for the recall to be announced publicly. In addition to company-initiated public notices or recalls, most recalls are posted on CFIA's website, www.inspection.gc.ca. Once a company has made every effort to retrieve control of as much of the affected product as possible, CFIA will conduct recall effectiveness checks at retailers to provide reasonable assurance that the company has withdrawn all products from the market. Likewise, companies should be checking the marketplace for recalled products. As quickly as possible, during or immediately after a recall, a root cause analysis must be conducted and corrective actions implemented and verified.



RECALL COMMUNICATION

While it is not the intent of this article to delve into the world of risk communications, there are some basic things that are essential for companies to consider when faced with a recall attracting media and public attention. It is essential to have a well prepared and credible spokesperson ready for the media to talk to. Speaking points should be developed and the spokesperson should stick to these points. The message is always – Food Safety comes first, and the company is doing everything possible to protect consumers. If a recall is associated with illnesses, the media and public attention will be heightened and it is prudent to have both legal and communications experts provide advice in these situations.

OTHER CONSIDERATIONS

A) Help during a recall

When a recall happens, companies can quickly become overwhelmed by the demands for information, decisions, and actions. Many companies recognize this challenge and incorporate external help as part of their recall planning. Some firms have pre-determined specialists or consultants they can call on to help with advice, technical communications, or even direct management of the recall. This approach can be of particular help to small or medium-sized companies who do not have in-house expertise in this area.

B) Insurance

Some insurance companies who specialize in the food processing area provide incentives for policy holders who are willing to implement enhanced emergency and recall management preparedness measures. This could be a good way to reduce both risk and costs at the same time.

CONCLUSION

The motto "be prepared" is the overriding theme when it comes to food safety issues and food recalls. While it is always the fervent hope that a company will never have to deal with a food recall, even the best-run firms may face an issue at some point. Better awareness and basic planning can put any company in a good position to manage a recall effectively and continue to thrive as a business. ■

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Canada's Role in Fighting Global Food/Nutrition Insecurities

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According to the United Nation's Food and Agriculture Organization (FAO), 'Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life'[1]. The definition embodies everyone's basic right to adequate food, to be free from hunger and to enjoy general human dignity[2]. Despite this, one in every eight people does not have enough to eat, therefore, the food that is produced must also contain sufficient nutrients to sustain life and fend off diseases, thus the term food security must also imply nutritional security, i.e., food and nutrition security. For the purpose of this review both the terms "food and nutrition security" and the "food security" will be used interchangeably. Ever since the food price crisis in 2008, which caused social and political unrest in several developing nations, there has been a renewed sense of urgency and commitment among political and scientific communities toward increasing food production and meeting the challenges of an ever-increasing world population set to reach the nine billion mark by 2050[3]. Although food and nutrition insecurity remains a significant challenge in many regions of the world, sub-Saharan Africa and Asia, as well some countries in Latin America and the Caribbean, account for ~90% of undernourished people in the world. In these high-risk populations, poor nutrition accounts for almost 50% of all childhood mortality under the age of five years, with childhood malnutrition causing over 2.5 million deaths every year. In 2009, the World Health Organization (WHO) estimated that there were at least two billion people with vitamin and/or mineral deficiencies. These deficiencies are highly treatable with the appropriate foods/supplements. Lack of food/good nutrition means loss of economic activity greatly needed in developing countries as populations cannot work at full capacity when their health is diminished, and therefore economic progress is stalled. Industrialized nations, such as Canada and the United States are not immune either, albeit lesser in severity and magnitude relative to the total population. Food insecurity is also not necessarily restricted to remote locations, such as those experienced by indigenous people in Northern Canada, but also occurs in many urban and rural settings that have at-risk populations[4]. Recent statistics from Statistics Canada[5] published in 2015 describing 2011-2012 data reported the following:

- Rates of food insecurity have been relatively stable since 2007;
- Approximately 5% of children and 8% of adults in Canada live in homes where food is insecure;
- Approximately, 8.3% of Canadian households experienced some level of food insecurity; the rates are highest in Nunavut (36.7%);
- The rate of food insecurity is three times higher in homes whose main source of income was government benefits relative to those with alternative income sources; and
- Single parent families with children under 18 tend to experience the greatest food insecurity.

Although access to affordable nutritious food within Canada is of significant importance, this review focuses on highlighting Canada's role on the world stage in addressing global food insecurity issues as it relates to research initiatives.

OH CANADA

Canada has consistently been a strong international partner to the United Nations in terms of increasing food security in developing nations. At the G8 2009 L'Aquila Summit, Canada announced its food security strategy providing significant funding towards: a) food assistance and nutrition, including supporting programs that promote life-saving nutrient rich food supplements (such as the World Food Program or WFP), and strengthening national and regional food reserves for alleviating crises in times of natural disasters, famine and war; b) sustainable agricultural development; and c) research and development, through the Canadian International Food Security Research Fund (Department of Foreign Affairs, Trade and Development Canada, www.international.gc.ca) and the International Development Research Centre. Further, the Canadian Government works to help secure the future of children and youth internationally, including aiding in maternal, newborn and child health through accessing nutritional supplements and therapeutic foods, and contributing to school food programs.

FACTORS AFFECTING FOOD INSECURITY AND THE IMPACT ON BASIC LIFE

Global food and nutrition insecurity is driven by a complex set of integrated factors, some of which include: poverty, population growth, urbanization, unstable social and political regimes, war and civil unrest, constraints in natural resources, transportation, a poor human resource-base, gender inequality, inadequate education, crop disease/infection, poor health and natural disasters (e.g., drought and famine). Many of these factors can have a severe impact on food production, supply, price volatility, food waste, institutional policies, trade, production of non-food crops, as well as stresses on water and desertification and climate change[6-9].

Many studies have indicated that adults in food and nutrition insecure households have poorer mental and physical health, poorer oral health, greater stress, and are more likely to suffer from chronic conditions such as diabetes, hypertension and mood and anxiety disorders. Recent research in developing countries reveals a higher risk for obesity among food insecure individuals when compared to their food secure peers[10]. Food and nutrition insecurity also makes it difficult to manage existing chronic conditions such as diabetes and HIV. For example, food and nutrition insecure individuals with HIV infection that is associated with increased energy and protein needs are critically constrained in their ability to control the quality and quantity of food they consume[11]. In the case of children, malnutrition can lead to issues surrounding growth and development, stunting, brain development, behavioural and social challenges[11].

ROLE OF GOVERNMENT AND UNIVERSITY RESEARCH IN CANADA

In order to meet the needs of the growing global population and reduce food and nutrition insecurity in developing nations, various research initiatives and institutions have been set up across Canada. For instance, the Canadian government funds research projects through the Canadian International Food Security Research Fund (CIFSRF) and the International Development Research Centre (IDRC), led by researchers from Canadian universities and organizations to tackle a wide range of issues. These include topics such as sustainable agricultural, complementary foods, improve feeding strategies for livestock, enhanced crop yield, urban agriculture, soil fertility, labour saving farming technology, animal vaccines, food preservation, irrigation technology, on-farm food safety[12,13]. A few examples include: a) developing innovative packaging and nanotechnology to extend the shelf life of fruit to reduce post-harvest losses of mangoes under poor storage conditions in Sri Lanka and India[14] (based at the University of Guelph), and b) improving potato production for increased food security and nutrition of indigenous communities in Colombia (based at McGill University)[15-17]. At the University of Saskatchewan, the Global Institute of Food Security has funded initiatives focused on the development of therapeutic food products comprised of pulses and cereals, optimized for protein quality as a means to address moderately acute malnutrition in Northern Ethiopia, as well as another initiative focused on the bio-fortification of lentils in Bangladesh. This is now underpinned by discovery research into critical factors for crop productivity or nutritional quality, such as seed development, rhizosphere biology and nutrigenomics. Further, an International Nutrition Group based at the University of British Columbia tackles food security through projects ranging from the development of micronutrient powders, gender and food culture, food safety and enhanced agricultural productivity[18]. In addition, the Global Institute of Food Security at the University of Saskatchewan and the McGill Institute for Global Food Security at McGill University are two examples where Universities are already mobilizing resources to drive research and innovation in this area. Research tends to be highly collaborative, multi-disciplinary and multi-institutional in nature. Canadian universities working on food security related topics count with a very important critical mass of experts in the various disciplines (i.e., soil, plant, food, animal, and environmental sciences, nutrition, bio-resource engineering, economics, and social sciences) required to generate advances towards global food and nutrition security, which continue to be among the most critical goals in sustainable international development. Nevertheless, the multidisciplinary work demands the incorporation of an intersectorial approach, without which advances in the "real world" are impossible. In order to achieve real impact in the livelihoods of the most vulnerable populations to hunger the academic sector is obliged to establish and constantly cultivate the collaboration with the private and public sectors, as well as with the non-governmental sector. To be effective and positively impact people's everyday life, the collaboration needs to stretch all the way from the conception of ideas, solutions and innovations to their implementation on the field. This is an approach that although theoretically conceived years ago is just recently making its way into actual work environments.

ROLE OF NGOS

Domestic and International non-governmental organizations (NGOs) operating in Canada link their activities with governmental agencies like Foreign Affairs Trade and Development Canada (FATDC) or Canadian International Development Agency (CIDA) and other NGOs to maximize the reach and effectiveness of food assistance strategies in the developing world. The emphasis of these organizations is sustainable development in working towards alleviating food insecurity and poverty. For example, NGO Canadian Hunger Foundation has worked on food security issues for over 50 years. Recently, it has committed to grassroots projects in rural communities in Ethiopia, Ghana and Bangladesh to help farmers diversify crop and livestock productivity to equip people to better adjust to economic or environmental shocks and stresses that impact local food production[19]. Other NGOs like UNICEF Canada partner with the private sector and governmental agencies to provide food assistance to those who are suffering from malnutrition and undernutrition[18,20]. In conjunction with other UN agencies, UNICEF Canada collects donations and supports international projects geared towards children's health and wellbeing including the procurement and distribution of ready-to-use therapeutic foods for emergency food situations. Oxfam Canada and Save the Children Canada are also working towards addressing food insecurity issues by linking their efforts with other Canadian stakeholders.

CORPORATE SOCIAL RESPONSIBILITY

Corporate Social Responsibility (CSR) is as important component of Canada's commitment to international food security goals. Firms increasingly view responsible innovation in the agrifood sector as a strategic necessity to ensure long-term sustainability and to create "shared value" through their activities and investments, benefiting all stakeholders in the agrifood supply chain. Maple Leaf Foods, for example, has a community outreach programme that supports food and nutrition research seeking to address international food security challenges. Maple Leaf Foods currently supports UNICEF Canada by providing emergency relief funding and food supplies to those in need[21]. In Saskatchewan, Potash Corp has invested $35 M towards Food Security research through the Global Institute for Food Security, with Viterra committed an additional $2 million to the Institute. Government agencies also see an opportunity to invest in growth strategies that draw on the strengths of stakeholders in the private sector. The Canadian government promotes accountability and innovation by private sector investment through the G-20 initiative AgResults. AgResults "only disburses public funds to partners that demonstrate measurable results in targeted areas such as improving harvest management and nutritional fortification of staple foods."[22] Moving forward, CSR in the agrifood sector requires collaborative and coordinated efforts between public and private actors to address emergency food aid situations and to deliver responsive and accountable projects that deliver broader social and economic benefits.

IN SUMMARY

In summary, Canada continues to strive to address challenges associated with global food insecurities around the globe through research and innovation, knowledge transfer and capacity building within the high risk communities. Through partnerships and a highly collaborative environment between universities, NGOs and industry, lives are being saved and communities being built.

"Solving hunger boosts economic development, builds the brains and bodies of the next generation and builds a stronger, more prosperous and secure world." (World Food Program, www.wfp.org)

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RECENT ADVANCES IN ICE CREAM SCIENCE AND TECHNOLOGY:

The University of Guelph's Ice Cream Centennial Symposium

Text by By Prof. H. Douglas Goff

The University of Guelph celebrated a significant milestone in 2014, the 100th anniversary of the Ice Cream Short Course. This article provides a synopsis of the industry-based symposium, focused on recent advances in ice cream ingredients, processing and marketing, that was held following the course to mark this important milestone in Canadian ice cream education. This course is the longest continuously running course at the University of Guelph and the only one of its kind in Canada. It has trained more than 3,000 people from around the globe in the science and art of ice cream making in its 100-year history.

ICE CREAM SWEETENERS

The first speaker of the Centennial Symposium was Mariana Macovei, Senior Technical Service Technologist with Ingredion Canada Inc. in Mississauga, speaking on *Advances in Ice Cream Sweeteners*. Canadian regulations allow for the use of natural sugars and starch hydrolysates in ice cream but products sweetened with sugar alcohols or high-potency sweeteners have to be labeled as frozen desserts. The sweetener system has to deliver appropriate intensity and temporal profile of sweetness, but also appropriate freezing point depression, body/texture and total solids. No Sugar Added products are an important category to many consumers. Those sweetened with maltitol syrups, which are low in glycemic index, can match the freezing curves of mixtures of sucrose and corn starch hydrolysates quite well. If necessary, sweetness responses can be adjusted with either synthetic high potency sweeteners, such as sucralose, aspartame or acesulfame-K, or with high Reb-A glycoside stevia, an all-natural plant source of high potency sweetness. In the carbohydrates area, there is also considerable new interest in the short-chain fructo-oligosacchardies as a prebiotic soluble fibre processed enzymatically from a non-GMO cane sugar. In addition to acting as a dietary fibre for Claims purposes, these can be used for texture modification, flavour and sweetness modification and freezing point depression control due to their low molecular weight, especially in low or non-fat applications.

ICE CREAM STABILIZERS

Finn Hjort Christensen, Group Manager, Ice Cream Application, with DuPont Nutrition & Health, Brabrand Denmark, addressed the topic of *Advances in Ice Cream Stabilizers*. Hydrocolloid polysaccharides and emulsifiers in a stabilizer blend deliver several functionalities to frozen dessert systems related to body and texture and shelf-stability. Although gelatin and egg yolks were used in early recipes, and in some cases still today, commercial stabilizer blends have been available since the 1950s-60s with continuous

THE HIGHEST AGE GROUP SEGMENT OF THE MARKET IS

25 TO 34

77%

OF THOSE AGED 25-34 EAT ICE CREAM

THIS GROUP ALSO REPRESENTS THE HIGHEST AGE SEGMENT OF GELATO CONSUMERS

advancement in ingredients and processing technologies since that time. One of the newest ingredients is propylene glycol monostearate added to stabilizer blends (IcePro) for heat shock protection. PGMS exhibits exceptional ice crystal control, both initially at the time of hardening and during subsequent temperature fluctuations. The incorporation of PGMS offers enhanced storage and distribution stability, improved consumer quality, cost reduction possibilities through elevated hardening, storage or distribution temperature requirements, and the opportunity for modified low-solids (hence high moisture), nutrition-oriented (low fat, low calorie, low sugar) formulations. Another recent stabilizer technology has been designed for the increasing artisanal market, where cold-solubility is required, homogenization is often not performed and optimal textures are required to offset limits in processing technologies (e.g., batch freezing, inadequate hardening). Christensen also demonstrated a new stabilizer system for water ices with large inclusions, e.g., fruit pieces, prepared in top-filled molding equipment where settling of inclusions before freezing can often be a problem. For such applications, the incorporation of gellan gum into the stabilizer blends has shown to provide suspending properties without giving high mix viscosity. Future trends for hydrocolloid/emulsifier stabilizer blends include perceived naturalness, clean labeling, sustainability, nutritional delivery of dietary fibres and satiety, and continually-evolving textural profiles.

ICE CREAM FLAVOURS

Azeem Mateen, Marketing Manager, Sweet Flavours – North America with Sensient Flavours, Hoffman Estates IL, presented an update on *Advances in Ice Cream Flavours*. Unique Canadian characteristics include strong international influence, significant number of younger immigrant adults and diverse tastes allowing for strong flavour innovation. The highest age group segment of the market is 25 to 34-year-olds, 77% of whom eat ice cream. This group also represents the highest age segment of gelato consumers. This group also consumes a more diverse flavour spectrum of products than do older age segments, opening opportunities for a wide array of new flavour introductions in Canada. Some recent examples of these include cinnamon bun, cupcake, caramel macchiato, pumpkin pie, espresso, cherry amaretto, crème brulee and dulce de leche. New flavour trends include healthier flavour offerings (e.g., natural fruit and vegetable-based flavours, Greek-style yogurt-based products, use of plant-derived natural, high-potency sweeteners), innovative twists on familiar flavours (e.g., sweet and salty pairings, spice blends, florals, drink-based flavours like Margarita or liqueur-based flavours like Amaretto), and enhanced textures through flavouring ingredients. In the texture area, crunchy, creamy, soft and smooth descriptors are all on the rise in new product introductions. One new product promotes "gooey" chocolate brownie. The texture of inclusions can often be preserved with edible coatings such as chocolate-coated biscuit pieces. The use of "old-fashioned" and "nostalgic" descriptors is also on the rise in new products like maple taffy or real mint leaves with chocolate fudge or cake-style flavours like carrot cake or baked Alaska. Flavour is a key driver in consumer choice so flavour advancements offer a wealth of opportunity for ice cream manufacturers, to take advantage of indulgence, hybrid or cross-over flavours, nostalgia, textured flavours and seasonal specialties.

ICE CREAM PROCESSING

Advances in Ice Cream Processing was covered by Gustav Korsholm, Ice Cream Americas, TetraPak Inc, Vernon Hills, IL. Considerations for processing line investment should include securing lowest product cost at highest quality, minimizing consumer complaints and give-away, minimizing start-up and rework losses, personnel and product safety, ease of operation and cleaning, line flexibility and customer support. A recent advancement has been the use of non-toxic, low cost and energy efficient CO2 as a refrigerant for new installations. Advances in ice cream mix blending equipment include improved mixing efficiency with increased flexibility for a wider range of dry and liquid ingredients through combinations of low and high shear and vacuum blending to reduce foaming during powder incorporation. Advances in continuous freezers include further waste and rework reduction at start-up and shut-down and during flavour changeovers, accuracy and product quality with discharge pumps on each filling lane, and power and energy efficiency. Particulate ingredient dosing has been improved with more sophisticated hopper and auger designs, more dosing volume control with feedback from/to the continuous freezer and multiple ingredient capabilities. In new filling equipment flexibility, safety, capacity and fill accuracy are the goals. Personnel safety has been greatly improved with enhanced guarding on equipment, designed to allow for easy package restocking. Spiral freezer advancements have focused on energy efficiency of airflow, sequential evaporator defrost and multiple drum drives for backup. Extrusion lines are now pushed to >700 pieces/minute; increased flexibility and improved cleanability are the main focus for advance. Molding lines continue to focus on reduced water usage and enhanced flexibility, for example filling heads for particulates. Future expectations for processing equipment include more sophisticated controls on smaller-scale equipment, higher capacities in larger-scale equipment, more automation, enhanced product and personnel safety and reduced product cost.

ICE CREAM PROMOTION

John Leveris, Assistant Director Market Development - Food Service with Dairy Farmers of Canada (DFC), Montreal, QC, provided an overview of *Ice Cream Marketing from DFC*. The focus from DFC has been promotion of 100% Canadian milk, the symbol of which has been consistent with consumer perceptions of high quality, purity and origin. Ice cream sales have trended down in Canada due to the introduction of frozen desserts made with tropical oils rather than milkfat, and also due to consumer concerns around fat and sugar. Hard ice cream production has dropped from a high of 316 million litres in 2005, before the introduction of frozen desserts, to 157 million litres in 2013. Therefore, DFC's marketing programs since 2011 have aimed to increase sales of Canadian ice cream brands that utilize the 100% Canadian Milk symbol on pack and to educate and encourage consumers to look for the 100% Canadian Milk symbol and to look for the words "Ice Cream" on the package label.

CELEBRATING OUR SUCCESS

The Centennial Symposium concluded with a gala luncheon during which financial donors toward new ice cream processing equipment for the University of Guelph's food processing pilot plant were recognized. These included the Ontario Dairy Council, the Dairy Farmers of Ontario, TetraPak Inc., the Colwyn and Jean Rich Foundation, Food Specialties and the OAC Dean's Office Food Leaders Fund. The lab has now been equipped with a new TetraPak S700 continuous freezer, ingredient feeder and ripple pump, to replace 50-year-old equipment. This opens the door for expanded future use of the ice cream processing facilities, perhaps to manufacture ice cream for sale on campus. Further equipment investment would be required to make that a reality. Continental Ingredients Canada and TFI Canada/Taylor Freezers were also recognized for their financial support of awards presented during the annual Ice Cream Course.

ENTREPRENEURIAL OPPORTUNITIES

Finally, Ryan Berley of the Franklin Fountain, Philadelphia, PA, presented his experiences at restoring a 19th century building and opening, in 2004, an authentic early to mid-20th century ice cream parlour and soda fountain. Ryan also discussed the current market for and interest in ice cream memorabilia, as celebrated through the Ice Screamers Association of Lancaster, PA. This presentation showed how the history of ice cream can be celebrated and nostalgia turned into a business and marketing opportunity. In the Canadian ice cream industry entrepreneurism seems to be strong so the combination of an excellent quality, authentic product together with turning its purchase into a true nostalgic experience could be a recipe for success.

The 2015 University of Guelph Ice Cream Course will be held Dec. 7-11 in Guelph, ON. Information will be available at www.uoguelph.ca/foodscience .

Further details on technical aspects of ice cream ingredients, manufacture, structure and quality can be found in: Goff, H. D. and R. W. Hartel. 2013, Ice Cream, 7th ed. Springer, New York.

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RECENT NEW FLAVOUR INTRODUCTIONS IN CANADA INCLUDE CINNAMON BUN, CUPCAKE, CARAMEL MACCHIATO, PUMPKIN PIE, ESPRESSO, CHERRY AMARETTO, CRÈME BRULEE AND DULCE DE LECHE.

JUST CRAFT SODA

NATURAL SOFT DRINKS IN COOL FLAVOUR COMBOS APPEAL TO MODERN FOODIES

Text by Lekha Kanagasabai

Familiar with the ins and outs of the beverage business, John McEachern has proven that he is a force to be reckoned with. "Part of the reason why beverages are interesting is because all of my experience is from that industry," he says. A veteran amongst food giants, McEachern has worked with the likes of Pepsi Co., and most recently, General Mills. Armed with knowledge, determination, and a mind bubbling with fresh ideas, McEachern has stepped out from the confines of the industry to launch Peak Drive Beverages, where he is Founder and CEO. McEachern's newest and first venture for Peak Drive is Just Craft Soda, a range of natural soft drinks that come in bold, intriguing flavours ranging from Lemon & Lemongrass to Peach & Habanero. An unapologetic foodie, McEachern curates these flavours in his very own kitchen, citing no precise methodology to his madness, just good old experimentation.

WHAT IS THE COMPANY'S PHILOSOPHY?

All the products I produce are never going to be based on a health claim. That's kind of one of the things that's most interesting that might make people surprised. Where I'm coming from with that is all of the health trends that I've seen, they're often very faddish. I don't want to build brands on health claims because I feel like they could be gone tomorrow. On top of that, the science behind them is incredibly shaky, and it just doesn't feel consistent with what I'm trying to do in producing natural products that are good just because they are made with better ingredients, not necessarily because they have a function.

WHAT MAKES JUST CRAFT STAND OUT AMONGST A SEA OF BIGGER COMPANIES?

We're trying to craft an image that works with an older, more mature consumer. I'm talking about older Millennials who are interested in an image that resonates more with who they are at that stage in their life. I go back to a lot of the soft drinks I loved growing up. They really spoke to me as a 15 to 25-year-old male, but as you get older, suddenly those brands don't really speak to you and there's a bit of incongruity with those brands in your life.

HOW DIFFICULT IS IT TO START A SODA COMPANY IN AN INCREASINGLY HEALTH-CONSCIOUS ENVIRONMENT?

Sugar has been, to a certain extent, demonized by the press. The reality is that products with sugar are delicious and make us feel good. Myself as a consumer, I've drastically cut down the amount of sugar I consume, but I still look for those high-quality treats. I want people to consume this soda as part of a balanced, healthy lifestyle. Some of the big soda companies have saturated the market to such an extent that they need to get people to drink more. I'm in a great position where I'm starting from scratch, and if I can get people to choose my product as a treat once in awhile, then I can really build a sizable business.

COKE OR PEPSI?

It's an easy one for me. It's Pepsi. And that's because I worked with the company for a relatively long time and I think it's a fantastic company. I love their products and I think it's a great organization that does some really great things. ■

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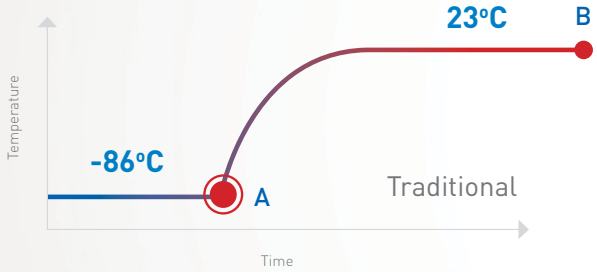

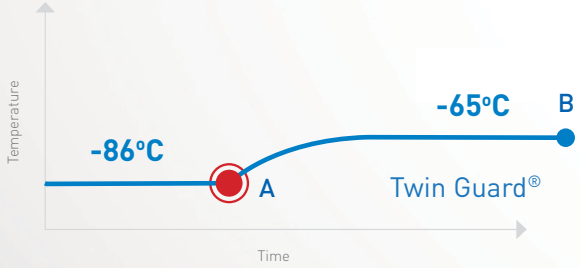

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