> VOLUME 2, ISSUE 1 > SPRING 2014

Canadian*food*Insights

Despite high-profile closures and a growing trade deficit, experts remain positive on the future of the Canadian food manufacturing sector PG. 26

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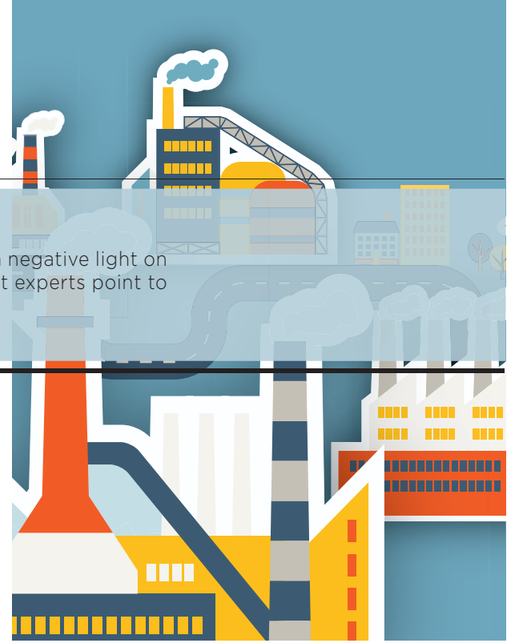
Growing Pains 26

Recent high-profile closures have cast a negative light on Canada's food manufacturing sector but experts point to glimmers of hope in the sector's future.



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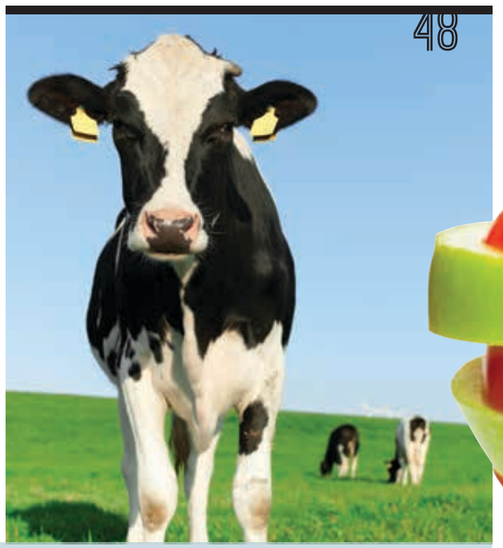

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Nicolas Heffernan

EDITOR FOR
CANADIAN FOOD INSIGHTS

Modifying the GMO discussion

Oh, GMOs. What are we to do with you?

One minute you're the answer to world hunger and malnourishment. The next you're an environmental scourge upon the earth that is slowly killing us all.

And therein lies the problem. Consumers don't know who to believe. So many people are focussed on disinformation that the truth – the science – doesn't get a chance to be heard.

Because when you get to page 19 and read the story of the Arctic Apple, which is currently in the regulatory reviews process in both Canada and the United States, it's exciting. But it makes you think of the incredible potential of GM technology in other projects. Take Golden Rice, a crop that biosynthesizes beta-carotene, a precursor to vitamin A. A shortage of vitamin A kills 670,000 children a year in underdeveloped countries but opposition has slowed down the approval process of this potentially lifesaving crop.

An apple that doesn't brown – it won't solve poverty or feed every human being on the planet. In fact, it will likely only be used by middle class citizens in North America. Let's face it, a bruised apple is a #firstworldproblem, but the Arctic Apple is a start. When people don't keel over and die because Okanagan Specialty Fruits used an apple gene to silence another apple gene to stop an apple from browning, maybe we can have a logical discussion about the potential for genetically modified foods on a much larger scale. If nothing else, it can be a tipping point to a climate where this subject can be discussed rationally and people can judge it on its merits instead of everything being obscured by a series of one-upmanship.

Sincerely

Nicolas Heffernan

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

SASKATCHEWAN MINISTRY OF AGRICULTURE
RESEARCH CHAIR
(Protein Quality and Utilization)

Department of Food and Bioproduct Sciences
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Welcome back everyone to our first issue of *Canadian Food Insights* in the New Year. To help satisfy your lull after our Olympic high, we have put together another great issue to highlight excellence in the Canadian food and beverage sector. I'd like to draw your attention to a brand new column in *Canadian Food Insights* by Sara Zborovski called 'The Regulatory Arena' meant to provide Canadians with the latest developments in regulations, labelling and food law. And to our featured technical reviews this time centered around the theme of food safety, to include articles such as: '*Current perspectives on the microbiological safety of fresh produce*', which highlights foodborne illnesses associated with fresh fruits and vegetables; '*Food inspection analyses – safety in numbers?*', which highlights the *Safe Foods for Canadians Act* and its impact on meat safety and inspection; and '*Food allergens and the Canadian food chain – working towards a safer food supply*', which highlights food allergens in our food supply, labelling, management and testing. As always, we have provided insights into some key movers and shakers within the agri-food sector, and touched on hot topics, such as genetically modified apples. *Canadian Food Insights* is also gearing up to cover all the excitement at IUFoST 2014, the World Congress of Food Science and Technology. *Canadian Food Insights* and our publishing team Dovetail will be the official media partner of choice for the biggest event of the year! IUFoST will be held in Montreal August 17–21. Look to *Canadian Food Insights* for pre-congress, congress and post-congress coverage in the upcoming issues of *Canadian Food Insights* magazine. Also, you can follow all the congress details at: (www.iufost2014.org). So, stay tuned as we put the Canadian agri-food sector on the world stage – hope to see you all in Montreal!

As always, I would like thank my colleagues on our editorial board, including our newest member, Sara Zborovski, and the team at Dovetail Communications for their time and dedication. *Canadian Food Insights* is proud to be CIFST's Official Publication for Canada's food and beverage sector and is looking forward to the exciting year to come. So please, sit back and enjoy!

Sincerely

Michael T. Nickerson

food EVENTS 2014

April 10, 2014
Quebec Suppliers Night
PLACE FOURZANI, LAVAL, QUE.

April 10-13, 2014
Canadian Health Food Association (CHFA) Expo West
VANCOUVER CONVENTION CENTRE

May 4-6, 2014
Bakery Showcase 2014
INTERNATIONAL CENTRE, MISSISSAUGA, ON

CANADIAN CONSUMERS CRAVE FLAVOUR INNOVATION

While traditional flavour profiles stand out on the menu, recent Technomic research also shows that Canadian consumers are on the hunt for flavour innovation.

An overwhelming majority of consumers (73 per cent) say that if they try and like a menu item with a new or innovative flavour, they're very likely to make a return visit to that restaurant for the same item.

"Today's foodservice consumers expect uniqueness on the menu – they're gravitating toward bigger flavours and standout flavour combinations that show some creativity. Operators and suppliers that promote differentiated flavour profiles can spark interest with consumers by eliciting cravings – which could potentially increase customer loyalty," says Darren Tristano, Executive Vice President of Technomic, Inc.

Technomic highlighted the latest consumer behaviours, preferences, attitudes and trends in its *Canadian Flavour Consumer Trend Report*:

- Eighty per cent of consumers agreed that they would like restaurants to offer foods that feature a combination of flavours; 66 per cent say they enjoy dishes that feature a fusion of flavours from more than one type of cuisine
- The popularity of spicy flavours continues to rise: a majority of consumers (56 per cent) say they enjoy very hot or spicy sauces, dips or condiments, compared to 50 per cent of consumers who said the same in 2011
- Customization is crucial for flavour: 64 per cent of consumers place high importance on the ability to customize toppings at limited-service restaurants, and 68 per cent say the same for full-service restaurants.

Agri-foods sector wins with Canada-Korea free trade pact

The Canadian agri-food sector received a boost with news of the Canada-Korea Free Trade Agreement (CKFTA).

The deal, which has yet to be fully ratified, but once in force will result in the elimination of 86.8 per cent of agricultural tariff lines. Some tariffs will take more than a dozen years to be fully phased out. This duty-free access will give Canadian agricultural products, including beef, pork, canola and grains, preferential access to the Korean market and will put Canada on a level playing field with Korea's current FTA (Free trade agreement) partners.

"This deal is especially important to Canada, with South Korea having already concluded Free Trade Agreements with the EU, Chile, Australia and the U.S.," says Rick White, CEO of the Canadian Canola Growers Association. "Until today we've been at a competitive disadvantage versus other oilseeds."

The CKFTA will not affect Canada's supply management system and its three key pillars: production control, import controls and price controls, which will remain intact. The CKFTA provides no additional market access, including no quota expansion and no reduction or elimination of over-access tariffs, for Korea's dairy, poultry and eggs.

food EVENTS 2014

June 4-6, 2014
2014 World Pork Expo
IOWA STATE FAIRGROUNDS, DES MOINES, IA

June 15-17, 2014
Canadian Poultry and Egg Processors Council (CPEPC) Convention
WESTIN HARBOUR CASTLE HOTEL, ON

June 16-18, 2014
(AAEI) Conference and Expo
HYATT REGENCY MINNEAPOLIS, MINNEAPOLIS, MN

June 21-24, 2014
Institute of Food Technologists Annual Meeting and Food Expo
NEW ORLEANS MORIAL CONVENTION CENTER

August 17-21, 2014
IUFoST -17th World Congress of Food Science and Technology & Expo
MONTREAL, QUEBEC

September 9-11, 2014
Canada's Outdoor Farm Show
CANADA'S OUTDOOR PARK, WOODSTOCK, ON

CANADA CAN BECOME A GLOBAL FOOD SUPERPOWER

Canada could move from being one of the top 20 net food exporting countries in the world to being one of the top five within the next few years, while addressing the legitimate needs of Canadians for safe, healthy and affordable food according to the Conference Board of Canada.

The organization's Canadian Food Strategy, unveiled at the third Canadian Food Summit 2014, is a blueprint for change in the food sector.

"The food sector already contributes more than eight per cent of Canada's gross domestic product and is directly responsible for hundreds of thousands of jobs. But it can become even more successful if our producers capture a larger share of the growing international food market, said Michael Bloom, Vice-President, Industry and Business Strategy. "Taken as a whole, the food sector has the potential to be among the foremost export industries for Canada."

The Canadian Food Strategy outlines several action items that could make Canada a food-exporting superpower.

- Expand presence in existing and emerging markets, including new markets.
- Link aid and trade to address the challenge of global food security.
- Negotiate multilateral and bilateral free trade agreements to improve exporters' access to international markets.
- Develop high-quality national, provincial, and regional food brands and product specializations for wide sale internationally.
- Build a Canada Brand to reinforce food brands and products using positive images of Canada's natural environment and culture and our reputation for product quality and safety.

The strategy sets out eight goals and more than 60 desired outcomes, and provides 110 action strategies that can help to achieve them.

Technology Could Increase Crop Yields and Cut Food Prices

The International Food Policy Research Institute (IFPRI) says agricultural technologies could increase global crop yields as much as 67 per cent and cut food prices in half by 2050.

Security in a World of Natural Resource Scarcity: The Role of Agricultural Technologies, a new report by the IFPRI pinpoints the agricultural technologies and practices that can significantly reduce food prices and food insecurity in developing nations. The study profiled 11 agricultural innovations: crop protection, drip irrigation, drought tolerance, heat tolerance, integrated soil fertility management, no-till farming, nutrient use efficiency, organic agriculture, precision agriculture, sprinkler irrigation, and water harvesting.

"The reality is that no single agricultural technology or farming practice will provide sufficient food for the world in 2050," says Mark Rosegrant, lead author of the report and director of IFPRI's Environment and Production Technology Division.

If farmers were to stack agricultural technologies in order of crop production schedules, the combination of agricultural technologies and practices could reduce food prices by up to 49 per cent for maize, up to 43 per cent for rice, and 45 per cent for wheat due to increased crop productivity.

The anticipated negative effects of climate change on agricultural productivity as well as projected population growth by 2050, suggest that food insecurity and food prices will increase.

Based on current projections, stacked technologies could reduce food insecurity by as much as 36 per cent. Making this a reality, however, depends on farmers gaining access to these technologies and learning how to use them. Adopting the technologies examined in the study would increase food production and improve food security under climate change.

COST OF BUSINESS CANADIAN FARMERS

CFIA RULES COST CANADIAN FARMERS $657 MILLION A YEAR

The cost of complying with the Canadian Food Inspection Agency's (CFIA) regulations is $657 million each year for Canada's farmers and the agriculture industry.

A Canadian Federation of Business report based on a survey of its agri-business members provides a review of how the CFIA interacts with farmers, as well as its impact on the agriculture sector.

The report highlighted the cost of CFIA regulations:

- Since 2006, the annual average cost of complying with the agency's rules and paperwork has increased from $19,000 to $20,396 per agri-business owner;
- Only one-in-five agri-business owners believe the CFIA provides good overall service, the same as previous findings in 2006, indicating there is no improvement in overall service.
- 60 per cent of agri-business owners say CFIA regulations add significant stress to their lives; and
- 46 per cent report that the agency's regulations significantly reduce productivity in their business, up from previous findings (40 per cent) in 2006.

"As CFIA modernizes Canada's food regulatory system through the *Safe Food for Canadians Action Plan*, we hope they make concrete and practical changes to address farmers' concerns, as things really do need to change," concludes Marilyn Braun-Pollon, CFIB's vice-president, agri-business.

PEOPLE PROFILE

Bowmanville grower receives Innovative Farmer of the Year award

Tom Barrie receiving his award. Photo from: www.ontag.farms.com

By Nicolas Heffernan

Creativity and advancements in crop rotation systems in his no-till farming operation earned Tom Barrie the 2013 Innovative Farmer of the Year Award.

The Bowmanville, Ont., native and his team was presented the award at the Innovative Farmers Association of Ontario Conference in February by BASF Canada and the Innovative Farmers Association of Ontario as a grower who promotes innovation and leadership in the agriculture sector.

Barrie, who farms with his brothers Steve and Glenn from Gordon Barrie & Sons, rotates corn, soybeans and canola followed by winter wheat which is under-seeded with red clover.

"Adapting technology and cropping methods on our farm has led to great success with crop quality and yield," says Barrie. "We're always striving to find better methods to prevent soil erosion and maintain the land. I think the future of agriculture will bring crops that can free up trapped nutrients and tolerate colder and wetter soils for early planting."

Now in their 21st year of no-till farming, the brothers' commitment to improving the efficiency on their farm has led to a crop rotation system that has improved soil structure, lowered fuel costs and equipment needs, and reduced trips over the field. Creating this system has made it easy for Barrie and his brothers to formulate cropping plans.

"BASF is proud to recognize Tom and the Barrie family as growers who implement an innovative and sustainable no-till farming operation," says Trevor Latta, Business Representative for BASF Canada. "The operation's use of soil protection practices is an excellent example of growers regenerating the landscape and farming for the future."

food EVENTS 2014

September 28+29, 2014
The Canadian Coffee & Tea Show
THE INTERNATIONAL CENTRE, TORONTO, ON

September 29 + 30, 2014
Grocery Innovations Canada 2014
METRO TORONTO CONVENTION CENTRE, TORONTO, ON

October 10-14, 2014
Anuga 2014
COLOGNE, GERMANY

EFC Welcomes Federal Funding for Research

The Egg Farmers of Canada (EFC) received $4 million in funding for poultry research and innovation from the federal government, an investment that was possible through the Agri-Science Clusters initiative of the *Growing Forward 2 AgriInnovations* Program (AIP).

The five-year investment in the Poultry Science Cluster will be leveraged by more than 50 contributing scientists from across the country for issues of great importance to the industry. "This research is focused on providing our farmers with a better understanding of certain poultry diseases, finding novel means for their control, contributing to the continuous improvement of poultry health and welfare and mitigating environmental impacts," says Tim Lambert, Chief Executive Officer of EFC.

The long-term, stable, and sustained commitment to research by both the government and industry generates the knowledge and opportunities to increase the competitiveness, productivity, and sustainability of egg farming while building poultry expertise that will be required by future generations.

$4 MILLION
FOR POULTRY RESEARCH AND INNOVATION

COMPANY PROFILE

Island Abbey's Newest Innovation

By Nicolas Heffernan

AFTER TRAVELLING IN SPACE WITH ITS HONIBE LINE OF FOODS, ISLAND ABBEY FOODS IS HOPING TO HIT SIMILAR HEIGHTS WITH PURAGAVE, ITS NEWEST INNOVATION.

The PEI-based specialty food and natural health product producer, has created a novel patented pure dried platform technology to solidify blue agave nectar. This new platform technology maintains the natural flavour, colour and other elements of the raw agave and does not de-nature it in any way. PurAgave follows closely on the heels of Honibe, an award-winning line of pure honey products that the Canadian Space Agency took to the International Space Station as a 'Snack for Space'.

"We are very excited to announce, after several years of research and development, our newest tasty product innovation: pure solid Agave," says John Rowe, President of Island Abbey Foods Ltd. "Our goal at Island Abbey Foods is to continue to introduce world's first products for consumers looking for high quality food and natural health products, as we have done with our Honibe brand. PurAgave is a reflection of our team's hard work and creativity as we continue to pursue this passion. All I can say is Mmmmmm, they did good!"

The PurAgave brand product line includes: PurAgave Agave Delights, the world's first 100 per cent pure dried Agave candy and sweetener for tea or coffee; and PurAgave Agave Lozenges, which contain 100 per cent pure dried Agave with a small amount of naturally derived menthol and eucalyptus, and no artificial ingredients.

MINISTER OF AGRICULTURE, PAT PIMM, IS LOOKING FOR MARKETS AT HOME AND ABROAD TO GROW B.C.'S AGRI-FOOD SHARE TO $14 BILLION

Text by Nicolas Heffernan

Talking to Pat Pimm, it's easy to hear the enthusiasm B.C.'s Minister of Agriculture has for his position. There's a lot of optimism in B.C. with Pimm's administration hoping to take B.C.'s agri-food sector to the next level. "It's a very exciting [time] for the agriculture industry and I'm certainly looking forward to it and I'm very excited to be the agriculture minister and the first agriculture minister from the Peace Country so that's something I'm quite honoured with," he says. Unfortunately, the initial enthusiasm has been tempered slightly with recent news of his colon cancer diagnosis and allegations he interfered with an independent Agricultural Land Commission tribunal decision. *Canadian Food Insights* spoke with Pimm before his diagnosis and the accusation to find out his vision for agri-food in B.C.

In broad strokes, what is B.C.'s agri-food strategy?

We're always working on improving agriculture and giving it a higher profile and a higher focus. Our agri-food strategy aims to take our industry from $10 billion to $14 billion by 2017.

How do you get that $4 billion increase?

We're always trying to make agriculture more viable. I think one of the important things is we have to make farming more viable for future farmers. We've got situations where the average age of the farming community is upwards of 55-years-old and some will say upwards of 60-years-old so we've got to get those younger farmers back into the picture and get them thinking about food security for our locals... and raising more awareness throughout the province that when you buy local, when you support local you're increasing the agriculture industry in the province.

In a recent survey, 85 per cent of British Columbians said they wanted to shop locally. Given there's an obvious desire to do this, what is the main difficulty in making this a reality?

I think the biggest part of the problem with making it a reality is you have to be able to make a good income from the agriculture industry and a lot of folks in the agriculture industry right now have to work off the farm as well to make ends meet. But, I think we're seeing some switches there. I think we're seeing farmers' markets really starting to expand, more people are using farmers markets and I think that's a great thing. As part of our Buy Local program we're trying to put a focus on farmers' markets. We're seeing some vast improvements there. I use Kelowna as an example – when it first started 10 years ago, their farmers' market had about 20 vendors and this year it had upwards of 165 vendors. The day I was in Kelowna last summer there were about 20,000 people in the market on a Saturday. I'm seeing some big expansions there.

What are B.C.'s strengths in agri-food?

The strengths of it are that we are so diverse. We have so many opportunities and I want to look at expanding our markets, and not only our domestic markets with Buy Local, but we want to certainly be able to expand our markets across Canada, certainly with some of our wine industries, but we also want to expand out into the Asian marketplace as well. That will be a big part of attaining the $14 billion goal that we're looking for. We just opened up cherries into the Asian market last year. Of course, you have to work closely with the federal government to make these things happen and now by opening up cherries into the Asian market the next obvious place to be looking is some of the berry crops and some apples and grapes and those sorts of things. Once you get your foot in the door it's about expanding on it and that's what we're looking to do.

Why are you targeting the Asian market?

We're targeting all places, actually, but Asia is one of the places that is pretty exciting for us. I use the forest industry as an example. In the early 2000s, about 85 per cent of our product was going to the American marketplace and that's very similar with our agriculture industry today. Now in the forest industry it's about 50-50 to Asia and to the United States. That gives you diversity and it allows you to look at two different marketplaces and I think that's really been a big improvement for our forest industry and I'd really like to pursue those avenues as well. But don't get me wrong, the United States and that marketplace is huge, as well as are some other world markets.

Shortly after taking over as Minister of Agriculture, Pat Pimm went on a tour of the province's extensive agri-food communities.

How would you say B.C. fits into the larger agri-food picture across Canada?

I think we're well positioned in B.C. but we have to do a few things. We have to find ways of making succession planning work for our families so children on the farm can stay on the farm and work their way through and take over the family farm at some point. I think we've done a great job of saving the agricultural land but I don't think we've done a great job or as good a job of saving the agricultural families and keeping them in the game as part of the agriculture industry in the future. That's certainly going to be part of my focus going forward.

In the fall, the provincial government announced plans to "modernize" the Agricultural Land Commission (ALC) that governs the Agricultural Land Reserve (ALR) in the province. The decision has sparked protests around the country as the organization's independent status would be removed and it would fall under the umbrella of the Ministry of Agriculture. With all that's going on, what impact will changes to the ALC and ALR have on agri-food in B.C.?

There are a few things you have to look at and obviously in my mandate letter from the premier, I was challenged by her to make sure the Agriculture Land Reserve and the Commission is working for British Columbia, so I'm looking at that. At this point in time, the mandate of the ALC is to save and protect B.C.'s valuable agricultural land. It doesn't say anything about saving agriculture families or any kind of succession planning. Certainly, I think we have to make sure we're looking at the agriculture families in that picture along with the agriculture land. I think the legislation is about 40 years old, times have changed a little bit and we want to certainly make sure our family farming is going to be viable going into the future and that's the way you're going to keep the agriculture industry strong.

With numerous discussions and meetings taking place around the province about genetically modified foods, where do you stand on the subject?

The bottom line in that whole discussion is it's a federally regulated initiative. I was actually at UBC when that discussion was happening and it was quite interesting to see there's an awful lot of emotion on both sides of that equation and it's not just everybody was opposed to the genetic engineering process. I think it's one that's in its proper position at this time with the federal government. It's an awful process; it's a long process to get anything approved through that system. There are also some real benefits to it but there are also some downsides to it as well. So it's something that has to be monitored closely and I think the federal government is doing a pretty good job at this point in time.

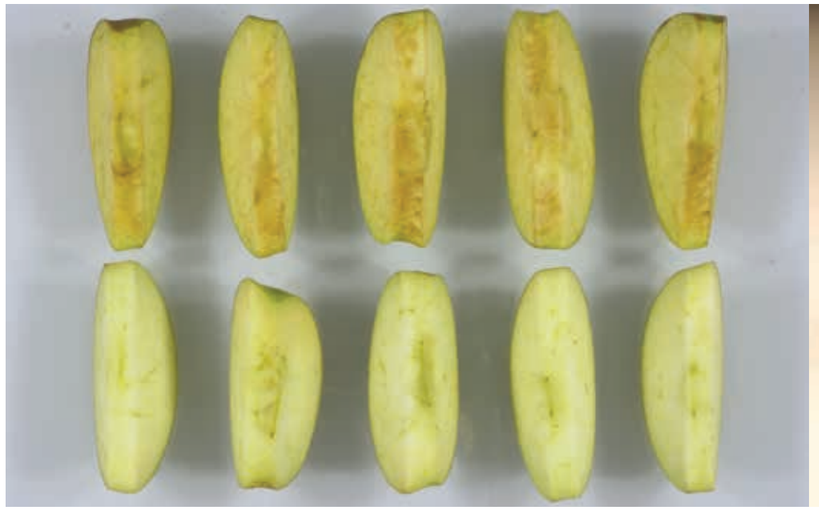
What is your long-term vision for agri-food in B.C.?

Obviously we want to up the production so we can get that $14 billion – if you can get that number up, all of your agriculture industry is going to be benefitting from that. I think the number one thing we have to do is we have to make it viable for the farming families to maintain and stay on the family farm. I think we need to do a lot around the education piece. Quite frankly I think people need to know, the food they're eating, where did it come from, how it was it generated, how was it built and I think we've kind of lost that piece a little bit. I think getting people to think local and buy local is a big part of it as well and most people that I've talked to around the province, they actually like the idea of buying local. Most people don't know that at this point in time, about 50 per cent of the food we're eating actually has a very strong local component. If we could get that number up to about 60 per cent then it's going to go a long way to reaching our target of the $14 billion.

forbidden FRUIT

AS GM FOODS BECOME MORE COMMON IN THE MARKETPLACE, CONCERNED CONSUMERS AND FOOD INDUSTRY ORGANIZATIONS ARE FIGHTING BACK AGAINST FOOD PRODUCERS AND RESEARCHERS

Text by Lindsay Grummett

Neal Carter's non-browning Arctic Apple continues to be a contentious issue as it moves closer to market approval.

The Canadian food industry is no stranger to the headlines. There was the Alberta beef recall back in 2012 and, of course, the legal battle of Michael Schmidt, an Ontario dairy farmer who's been in and out of court to defend his right to provide raw, rather than pasteurized, milk to consumers. But there's one subject that seems to capture the consumer's interest more than the rest: genetically modified (GM) foods or genetically modified organisms (GMO) as they're also known.

Genetic modification is the use of biotechnology techniques to directly manipulate a plant or animal's DNA. Brian Ellis, GM food expert and professor emeritus in the Michael Smith Laboratories at the University of British Columbia, explains the technology. "Effectively, you're introducing new genetic material directly into the plant genome so some traits can be added or deleted from the plant to improve its marketability or ease of production."

IN THE GARDEN OF GOOD AND EVIL

In Europe, there's been a forceful backlash to GM foods. Non-governmental organizations (NGOs) passionately promote their anti-GM message and activists have been known to destroy crop trials. The North American reaction has been much tamer although interest is gaining momentum on social media sites and petition platforms like Change.org. The latter allows people to start a petition like mother-daughter duo Linda Cirella and Maya Fischer from British Columbia who, at the time of print, had just under 30,000 supporters for their petition to "*Take All GMO Ingredients Out of Girl Guide Cookies*."

Ellis notes that credible GM food research has given no indication that these products have had any deleterious effects, but he's also quick to say that the scientific connection can be hard to make. "If there are long-term, low-grade effects, we won't see it and we won't really be able to connect it to consumption of various GMO food products because we have no means of tracking," he says.

Ellis says that this is one of the main reasons GM foods are such a hot button issue. "Playing with your food is something that's viewed as being close to affecting your personal health and well-being," he explains. "When people are asked about the idea of genetically modifying plants in order to make pharmaceuticals or antibodies, there's generally far less concern about that because it's not part of their food system."

However, as GM food producers and food researchers continue to innovate, they are faced with a growing resistance from uncertain consumers. As a result, companies like Okanagan Specialty Fruits have developed a transparent action plan to push their product toward market approval.

APPLES TO APPLES

Neal Carter, a Canadian fruit grower and president of Okanagan Specialty Fruits, is excited about his innovative non-browning apple. The Arctic Apple, as it is called, is different from typical apples in that it doesn't brown from biting, cutting or bruising. Apple gene sequences are used to silence the genes that typically allow enzymatic browning to occur.

"Basically, with the Arctic Apple, we're using an apple gene to turn off another apple gene," says Carter. "It's a very simple approach, but the end product of an apple that doesn't go brown is incredible."

Carter believes this innovation will be advantageous to producers and retailers.

"This apple is going to allow the people who are making it to get a little bit better margin on it," says Carter. "It's going to change the price point which will really influence sales and that'll drive up apple consumption."

The ease and convenience of the new, non-browning apple could also improve apple intake, similar to how baby carrots helped carrot consumption, although it should be noted that baby carrots are not a GM product.

In the public sphere, the Arctic Apple has become a polarizing subject. The BC Fruit Growers' Association requested the suspension of the regulatory approvals process for the apple. The group cites a variety of reasons including concerns with apple testing, the lack of public consultation, cross-pollination with non-GM apple trees as well as worries for the overall apple market.

"This places the entire apple market at risk, and we have asked that the government place an immediate, pre-emptive moratorium on this apple before our markets suffer," writes the President of the BC Fruit Growers' Association in a recent media release.

Genetic modification is the use of biotechnology techniques to directly manipulate a plant or animal's DNA

Canadian Biotechnology Action Network (CBAN) is another organization that's been very vocal in its opposition to the non-browning apple. "Consumers don't see it as a necessary product and they just don't want to eat it," says CBAN coordinator, Lucy Sharratt.

CBAN is a coalition of organizations that are concerned with the application of genetic engineering in food and farming in Canada. It includes groups like Ecological Farmers of Ontario, Canadian Organic Growers and Greenpeace Canada. "At CBAN, our concern is

"Basically, with the Arctic Apple, we're using an apple gene to turn off another apple gene. It's a very simple approach, but the end product of an apple that doesn't go brown is incredible."
–Carter

not just consumer-based. We're concerned about potential environmental impacts, the question of democracy, the question of rigorous regulation, and social and cultural impacts," she says.

Even with unrelenting opposition from NGOs and food industry groups, researchers from around the globe continue to come up with innovative ideas that could impact the food chain and alter the way we make use of our food.

THE POWER OF PURPLE

Cathie Martin, a plant biologist at the John Innes Centre in Norwich, England, has been researching the health benefits of purple fruits and vegetables with the help of genetic modification. Approximately 10 years ago, Martin became interested in the nutritional value of anthocyanins, one of the health-promoting compounds that are thought to be present in many types of berries such as blueberries. Martin mused that if she could make a tomato that produced anthocyanins (something the tomato does not do naturally) she could then test and compare the health benefits of red tomatoes against purple.

Her research progressed and she was able to test the purple tomatoes on animals, which produced fascinating and promising results. "Our testing was on mice that are particularly prone to cancer. When they were fed a diet supplemented with purple tomatoes, the average life expectancy of the mouse extended by 30 per cent, which is pretty significant," says Martin.

Early research noted that anthocyanins offered health benefits for major chronic diseases and Martin wanted to examine the advantages of anthocyanins in humans. She needed a farm willing to produce the purple tomato, but strict GM food regulations prevented her from locating one in Europe. Eventually, Martin began working with New Energy Farms in Leamington, Ont. "They weren't at all daunted by the fact that it was GM. They actually thought that it was a real benefit because it was something new and that there were many additional markets that could be explored in Canada," says Martin.

New Energy Farms grew the tomatoes in a controlled greenhouse environment following which the seeds and plants were burned to prevent cross-contamination. About 2,000 litres of purple tomato juice was processed by the company and will be sent to cardiovascular subjects in the UK in the coming months.

Although anthocyanins are found in purple fruits like blackberries and blueberries, the introduction of the pigment into tomatoes would provide its benefits to a wider consumer base.

"A lot of people don't eat those berries because they're expensive and seasonal," says Martin. "But here's something that is not going to cost a huge amount and it's something you're already eating in pizza or ketchup."

If the purple tomatoes continue to prove themselves, Martin says she will try to get regulatory approval in Canada for the tomato juice which, in turn, could lead to approval for the tomato in the fresh market.

The process for GM food approval in Canada is strenuous but Martin says it is all to ensure the safety of the consumer and environment. "Canada has an enlightened perspective on the regulatory approval of genetically modified foods. They're mostly concerned with the trait that's engineered and not the way it's been developed."

Health Canada's rigorous approvals process includes an assessment of a number of characteristics including, but not limited to, the composition and nutritional profile of the GM food as well as its non-modified counterpart, its potential for causing allergic reactions or producing new toxins in the food and even the chance of any unintended or secondary effects.

The genetically modified purple tomatoes were grown in a controlled greenhouse environment at New Energy Farms in Leamington, Ontario.

ARCTIC TRANSPARENCY

Consumer concern has yet to stop the Arctic Apple which was first planted in U.S. test orchards more than 10 years ago. Okanagan Specialty Fruits is now seeking deregulated status in both Canada and the United States which would allow it to plant trees without a permit and officially introduce the Arctic Apple into the marketplace.

In the U.S., Carter submitted a 163-page petition to the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA APHIS) who, in return, developed an Environmental Assessment (EA) and Plant Pest Risk Assessment (PPRA) which was then open to the public for comment. More than 72,000 statements were received during the first comment period.

The Canadian process is similar, with the Arctic Apple review being undertaken by the Canadian Food Inspection Agency and Health Canada. Petitions have been coordinated against the Arctic Apple by groups like GE Free BC and CBAN.

Carter is hoping to win over the undecided consumer with product transparency.

"As a company, we're small and we don't have the money for media ads so we're really active on social media," he says. "[We're] just answering and addressing any and every question that comes up, even the ones that say, 'We hate you, you're playing God!'"

Ellis says that Okanagan Specialty Fruits' markedly different approach to GM foods is a benefit to the company, product and industry.

"They've made no bones about the fact that they're bringing a GMO apple into the marketplace. They've given it a specific name that the consumer can identify. I think what will be particularly good about this project is consumers will, for the first time, have a choice," he explains.

Early research noted that anthocyanins offered health benefits for major chronic diseases and Martin wanted to examine the advantages of anthocyanins in humans

MARKET GROWTH

There are more than 81 GM foods that have been approved for consumption in Canada including produce like squash and papaya, yet they haven't stirred up controversy like the Arctic Apple and often go unnoticed as products of genetic modification.

"Apples are an iconic fruit," says Carter. "And if the apple business turns GM, even just one apple, now all apples are GM. That's the assumption."

Unlike in Europe and other parts of the world, Canadian law does not require mandatory labelling of GM foods. Opposition to labelling GM food items has made it impossible for consumers to know if the food they are eating has been modified genetically.

"Because government and companies have resisted calls for labelling, there's a very high level of distrust of the governance system and the companies promoting the products," says Ellis.

CBAN's Sharratt believes that the lack of GM labelling is influencing consumer choice.

"With no mandatory labelling, every time there's a news story about a new GM experiment, there are a number of consumers who think that product is already on the market."

Sharratt believes mandatory labelling will help consumers make informed choices, but also provide food manufacturers and producers with a better understanding of the wants and needs of the consumer.

"There's a great deal of confusion in the marketplace. Consumers don't know what products are GM and are making all kinds of assumptions. The food manufacturers and retailers don't know what those assumptions are and how they're affecting the market."

Some food manufacturers have expanded into alternative markets to appease consumers

THE EASE AND CONVENIENCE OF THE NEW, NON-BROWNING APPLE COULD IMPROVE APPLE INTAKE

looking for GM-free products. At the start of the year, General Mills announced it would start rolling out a new GM-free Cheerio. The product will be labelled "not made with genetically modified ingredients" although it should be noted that this is not an official accreditation.

Tom Forsythe, the company's vice president of global communications, addressed the decision on the company's blog, saying, "We did it because we think consumers may embrace it."

Although the decision has been positioned as an expansion move, it occurred just over a year after Green America, a not-for-profit organization seeking environmental sustainability, began the campaign "No GMO's, Cheerios!" General Mills received more than 40,000 messages on its Facebook page related to the campaign.

"Most of these big companies have such a diversity of products in the marketplace that they can have a GMO-free line for consumers," says Ellis, "although there is clearly a market for the GMO products too because a lot of people just don't care."

A recent U.S. study by The NPD Group titled *Gauging GMO Awareness and Impact* offered insight into consumer choice in the grocery store. Research revealed 67 per cent of all primary grocery shoppers are not willing to pay a higher price for non-GMO foods. There is a subset of grocery shoppers, however, who are aware and concerned about GM foods and willing to pay more. This group accounts for about 11 per cent of all primary shoppers.

Carter feels General Mills' decision is harmful and slights the efforts of food innovators like himself.

"This is such an inappropriate tool to use in marketing at this time. Particularly when General Mills is making a ton of stuff with GM products and deals with suppliers that supply them with GM-sourced products."

An organization called the Non-GMO Project has also found emerging business in the unstable food landscape and is offering food verification testing. The North American non-profit connects companies with laboratories that perform third-party PCR analysis on foods to determine whether they harbour any GMO properties.

"Another business opportunity has been created simply as a consequence of the fact that the GMO industry has resisted providing consumers with a mechanism for assuring themselves that they can make a choice," says Ellis.

TIP OF THE ARCTIC ICEBERG

Anti-GM activists may have caused a stir in the media, but it hasn't been enough to stop Okanagan Specialty Fruits from moving toward non-regulated status in both Canada and the U.S. Carter says that the review process in Canada is nearly complete, and in the U.S., the second public comment period finished on January 30 and a decision is expected soon. Carter is hopeful in both cases and anticipates the first crop will be harvested in September/October 2015. If everything goes as planned, Carter thinks apples will be just the beginning.

"With citrus greening being such a problem in Florida and the U.S., it's pretty well assumed that the solution to citrus greening will be biotechnology," says Carter.

Following apples and citrus, Carter predicts bananas to be the next on the GM agenda although he doesn't expect it to get any easier for companies producing genetically modified foods.

"The anti-GM guys are going to fight you tooth and nail," says Carter. "Every new [biotech crop] from now on will go through this kind of rigorous effort of trying to have it stopped."

But it's ultimately up to the consumer whether these foods will thrive or fail in the market.

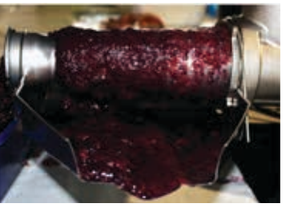
There are more than 81 GM foods that have been approved for consumption in Canada

"After regulatory approval, we'll get the trees in the ground and fruit in the marketplace. That's what will change everything. It's really very exciting. It'll no longer be all these people battling. We think the product is worth the effort and the consumer will decide," he says.

Further advancements in GM food technology could also help create a less polarized atmosphere. Ellis predicts there will be new techniques arriving on the genetic modification scene in the next five to 10 years that could transform the industry. "Genetic editing" allows the plant genome to be modified in subtle ways that will not leave modification machinery behind in the plant. Ellis says this technique is similar to traditional plant cross-breeding.

"It's very sophisticated, very targeted and I have a feeling this is where the technology is headed. In a way, that'll be far more acceptable to people than the current technology which in retrospect looks rather crude. I think a lot of consumers would find that a much more acceptable way forward."

ABOUT
2,000 LITRES
OF PURPLE
TOMATO JUICE
WAS PROCESSED BY THE COMPANY AND WILL BE SENT TO CARDIOVASCULAR SUBJECTS IN THE UK IN THE COMING MONTHS



MANUFACTURING DEFICIT DISORDER

DESPITE HIGH-PROFILE CLOSURES AND AN EXPANDING TRADE DEFICIT, AGRI-FOOD EXPERTS REMAIN OPTIMISTIC ABOUT CANADA'S MANUFACTURING FUTURE

Text by Nicolas Heffernan

Reports of the demise of the food manufacturing and processing sector in Canada may have been exaggerated.

After nearly 90 years in London, Ont., Kellogg will close the doors to its cereal plant by the end of next year, costing 500 jobs. The closure came on the heels of Heinz announcing the shutdown of its processing facility in Leamington, Ont., by June. Luckily for people in the Tomato Capital of Canada, Canadian law mandates tomato juice be extracted from "sound, ripe, whole" tomatoes instead of paste – a higher standard than in the U.S. A group of Ontario businesspeople stepped in and will keep the plant partially running as a tomato juice facility saving 250 out of the 740 jobs that would have been lost.

The two high-profile closures prompted musings among media, communities and government over the fate of the food manufacturing sector. The high-profile shutdowns prompted media to key in on the human, financial, economic and policy impacts of the news. Observers rapidly identified reasons for the closures, citing exchange rates, market factors, new owners, multiple input costs, age of facilities and regulatory issues, with government and industry quickly countering. Simmering underneath all the handwringing was concern over the long-term viability of Canada's largest employer.

Industry research groups argue the reaction might be overblown. "There's no question [the closures] have brought things more into the public eye," says Al Mussell, Senior Research Associate at the George Morris Centre, Canada's largest agriculture think tank, "but I guess I'm not seeing a crisis here. I think we're seeing some adjustments."

At face value, the Heinz and Kellogg closures are just the most recent closures in a long list, as over 143 plants have ceased operations since 2006. Yet in the same timeframe, there have been 60 new plant openings and 130 announced investments. The trend of plant openings and closures led Bob Seguin to describe the current market as "bipolar" in a George Morris Centre report entitled, *The Heinz and Kellogg Closures: What Direction for Canada's Food Manufacturing Competitiveness.*

What causes the Canadian Agri-Food Policy Institute (CAPI) to pause for thought is the trend that most of the companies that have been leaving are larger multinationals, primarily American, while investments have been made predominantly by larger foreign firms and Canadian companies. "There's been a restructuring taking place and the really important question going forward is, is that restructuring sufficient enough that it's repositioning us to be more competitive in the future," says David McInnes, President and CEO of CAPI.

While the Heinz and Kellogg situations clearly demonstrate that the sector isn't thriving, it doesn't necessarily mean food manufacturing is in any great peril in Canada either. In early December, shortly after the closures were announced, Seguin attempted to lend perspective to the closures by writing, "The demise of Canada's food manufacturing is not a 'done deal.' The closures of key Canadian food manufacturers in the past years and months are the results of a number of past market and public policy developments."

LARGEST EMPLOYER IN CANADA

Amid all the chatter about the shutdowns, it's easy to forget how big the food manufacturing industry is in terms of the Canadian economy. The food processing industry produces more than 70 per cent of the food Canadians buy and pulled in more than $88 billion in revenue in 2011. "Often there is not a lot of awareness that food manufacturing is such a major economic driver across the country," says McInnes. Food processing recently overtook the transportation equipment manufacturing sector as the largest manufacturing segment in Canada, and employs 300,000 Canadians, the most of any manufacturing sector. Nearly 40 per cent of the country's agriculture production is processed but in Ontario and Quebec it exceeds 65 per cent.

The statistics may be impressive but they can't hide the fact that the industry isn't functioning optimally. The announced closures over the past years have resulted in 24,000 job losses. The period between 2007-08 was particularly challenging with 48 closures outnumbering the 27 openings and plant investments in the country.

THE FOOD PROCESSING INDUSTRY PRODUCES
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The sector's trade deficit, which grew from $6.5 billion to $6.8 billion, is also a cause for concern, raising questions about Canada's competitiveness. CAPI is conducting research that offers explanations for the state of the trade balance. While the deficit is not a definitive measure, as it doesn't factor in domestic consumption or the food that is imported to be further processed then exported, it does call into question Canada's ability to compete globally. "At the end of the day, if consumers in Canada and consumers in foreign markets are not buying and consuming Canadian-produced food, and this deficit number indicates to some degree that's occurring, then we might have a real competitiveness issue," says McInnes.

Companies locate locally but export to markets provincially, nationally and globally and so the connection between how companies fare at the local level can affect how they run their plants or where they choose to select to serve those various markets

TRADE DEFICIT

Adding a layer of complexity to deciphering what the trade imbalance means is that despite the overall deficit, CAPI discovered there were subsectors, like bakery and french fries, operating with a surplus. "Coming up with a very simple answer for the deficit is very challenging because each company and each subsector work in very different market dynamics," says McInnes.

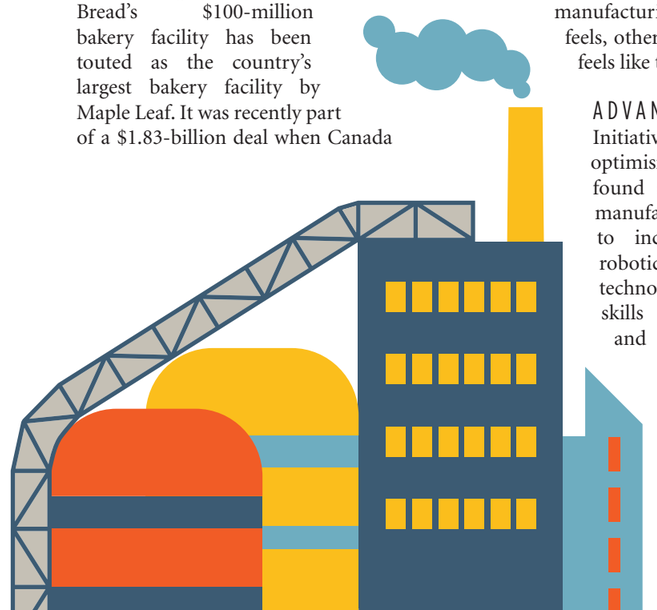
CAPI has devoted a lot of time and resources to determining whether current market conditions are encouraging growth. "We're seeing that there are important established economic drivers that are in place," says McInnes. He cites the accelerated capital cost allowance (ACCA), as a likely reason behind the increasing Canadian investment. ACCA is a two-year straight line depreciation rate for business investments in manufacturing and processing machinery and equipment that allows companies to write off investments against taxable income more rapidly than the previous depreciation method. "That's a very important tool for future growth or to help support future growth." New trade agreements with the European Union and South Korea should also help. "Increased market access is important in terms of international trade development," McInnes says.

But in order to encourage growth, change is also necessary. "We have to find ways to evolve structures, processes, rules and improve collaboration across the supply chain to take advantage of those opportunities," says McInnes. "It requires a new way of working, building on what we've got and if that formula is right then we have a bright future in food manufacturing."

Regulation is often cited as an area that could be improved and McInnes suggests current efforts to streamline regulation will pay off. "There are things that we need to do more of and the policy and regulatory structure has to evolve as the marketplace evolves." In order to create the most productive and open business environment McInnes suggests an increased role for municipalities. "Companies locate locally but export to markets provincially, nationally and globally and so the connection between how companies fare at the local level can affect how they run their plants or where they choose to select to serve those various markets," says McInnes. "So thinking about policy and regulation, we've always thought this is the domain of the provinces and federal government but we have to think of the municipal role."

A LIFT IN STEELTOWN

The potential of the municipality has been taken to heart in Hamilton, Ont. While long-time food manufacturing communities have been hit hard, the sector has found fertile ground in Steeltown, with Maple Leaf and Canada Bread setting up shop. Canada Bread's $100-million bakery facility has been touted as the country's largest bakery facility by Maple Leaf. It was recently part of a $1.83-billion deal when Canada Bread was bought by Mexican giant Grupo Bimbo. Although the effects of the takeover aren't known yet, the food processing and agri-business sector is worth about $1.3 billion in Hamilton. "There's now a growing recognition of the economic impacts of agriculture and food processing," says Keenin Loomis, CEO of the Hamilton Chamber of Commerce. "It's a growing sector for us – obviously that came at the expense of other communities – but we can only do the best we can to attract those types of jobs to the community."



Initiatives like the Innovation Factory's (IF) LIFT program have also helped entice older companies looking to restructure. Located in Hamilton and networked across North America, the Innovation Factory is a not-for-profit regional innovation centre. The LIFT program is designed to help companies identify challenges regardless of their stage of development. IF then works with the companies to build a tailored innovation assessment specific to their needs and goals. The IF offers access to industry experts, programs, and other resources to overcome the obstacles in each stage of development. Many food manufacturing companies in the area have been taking advantage of the program.

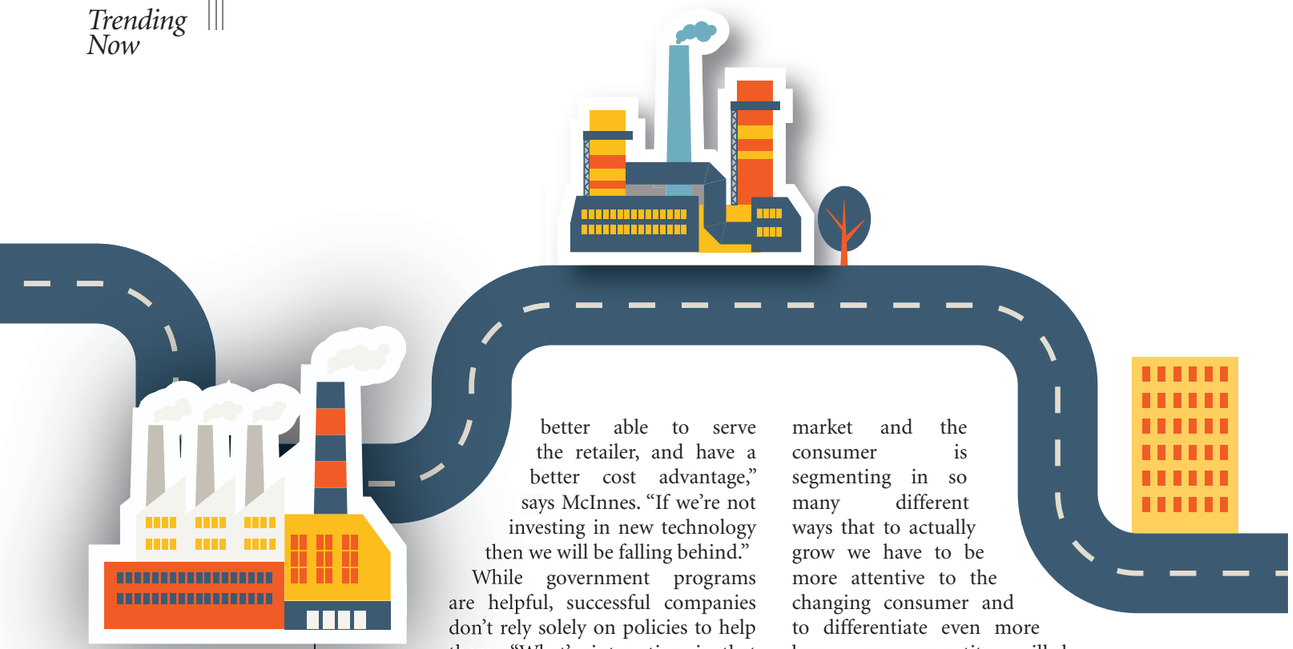
LIFT is leading to a boom in the advanced manufacturing space for Hamilton, with factories modernizing to take advantage of new technology. "So a little bit of Darwinism has happened," says David Carter, Executive Director of the Hamilton Innovation Factory. "You look at the big, shiny new Maple Leaf Plant and the interesting things being done to keep Canada Bread up to speed and so you tie manufacturing into what's going on and it feels, other than the bad news of some, it feels like the news is good."

ADVANCED TECHNOLOGY

Initiatives like LIFT are giving McInnes optimism for the future. CAPI's research found an increase in investment in manufacturing equipment leads to increased productivity through robotics, additional automated technologies, management systems, skills development for employees and management, and R&D. "[Technologically advanced plants] are vitally important because if other countries are more efficient in producing food then they will have the ability to be more nimble in offering new products,

THE SECTOR EMPLOYS
300,000
CANADIANS

"At the end of the day, if consumers in Canada and consumers in foreign markets are not buying and consuming Canadian-produced food, and this deficit number indicates to some degree that's occurring, then we might have a real competitiveness issue."
–McInnes



better able to serve the retailer, and have a better cost advantage," says McInnes. "If we're not investing in new technology then we will be falling behind."

While government programs are helpful, successful companies don't rely solely on policies to help them. "What's interesting is that we're seeing that the path to success is not all about what government can do," says McInnes. "They can certainly do some things to enable change and to be competitive but it's also how the companies themselves are investing, the degree to which they're connecting with their suppliers and producers and their ingredients and how they're working with the supply chain to create those successful opportunities, what markets they're aiming to serve and how they're innovating."

THE PERIOD BETWEEN
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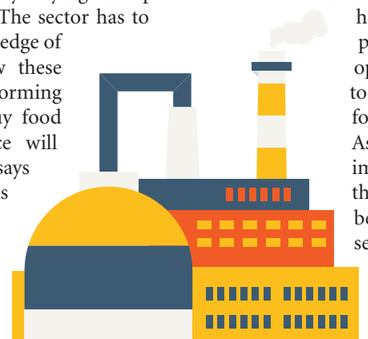
In order to truly deliver what consumers want, companies need to start with a supply of quality ingredients and work with all their other partners.

One of the best ways for food processors to carve a niche is by staying on top of consumer trends. "The sector has to be absolutely at the edge of understanding how these changes are transforming how consumers buy food and that difference will vary by market," says McInnes. "This is becoming such a competitive market and the consumer is segmenting in so many different ways that to actually grow we have to be more attentive to the changing consumer and to differentiate even more because our competitors will do so."

In order to truly deliver what consumers want, companies need to start with a supply of quality ingredients and work with all their other partners. "Inevitably you're working back with your supply chain and producers to deliver on what you hope will be a winner with the consumer," says McInnes. "So in a way, the greater the complexity and fragmentation of the marketplace the greater the need to work with the supply chain in a far more collaborative and complex way to be nimble and to take advantage of those opportunities."

HOPE ABOUNDS

Given Canada's agricultural strength, the country's reputation abroad, the foundation for quality products and all the attention that has gone into reviewing and enhancing the sector, McInnes believes there is no reason to panic. "Food manufacturing has a national foot print, it's in every province," says McInnes. "We're optimistic about the sector and we need to consider the strategic importance of food manufacturing going forward. As food processing is one of the most important economic drivers in Canada, the question is how do we sustain this being the number one manufacturing sector and enhance it."



CREATING THE BEST RECIPE

for the Ontario Food and Beverage Processing Industry to Grow and Prosper

TEXT BY
THE HONOURABLE GARY GOODYEAR, P.C., M.P.

Minister of State (Federal Economic Development Agency for Southern Ontario)

AS THE MINISTER RESPONSIBLE FOR THE FEDERAL ECONOMIC DEVELOPMENT AGENCY FOR SOUTHERN ONTARIO, or FedDev Ontario, I would love to host a dinner party for the food and beverage processing industry in Ontario. However, with more than 95,000 employees from more than 3,000 organizations, I don't believe there's a venue large enough in the province to accommodate this tremendous group!

Instead, I've spent a great deal of time over the past few months meeting with industry stakeholders in various cities to talk about the best recipe for making this industry grow and prosper.

There is no doubt that the food and beverage processing industry plays a key role in Ontario's and Canada's economy. Its economic spinoffs also have a direct impact on other players in the food supply chain, such as Ontario's many farmers.

However, I have been hearing you say that your industry faces fierce global competition, shifting consumer demands, challenges in accessing foreign markets, as well as difficulty accessing financing and R&D to further improve product and process innovation.

These economic realities highlight more than ever the importance of collaboration in this industry. Just as a recipe is never successful without all of the right ingredients, I truly believe that we are stronger, more productive and more successful when the public and private sectors work together – each bringing our unique talents, expertise and assets to the table.

For the part of the federal government, we are confident that we are providing the right ingredients – the right macro-economic conditions and the necessary targeted investments from across federal departments and agencies – to retain, attract and grow Canadian businesses.

FedDev Ontario was created in August 2009 to help re-establish southern Ontario as a key driver of innovation and growth within the Canadian economy. To date, we have committed more than $41 million to 51 food and beverage processing-related projects in southern Ontario, leveraging more than $292 million in additional funding.

In addition to investing directly in companies, I am pleased that we worked with partners such as the Canadian Manufacturers & Exporters, the Yves Landry Foundation and the Ontario Chamber of Commerce to improve productivity for businesses in your industry. Many of you may have benefitted from these programs. This has resulted in an investment of nearly $5.5 million in 131 projects, which has leveraged more than $13 million.

From investing in new plants such as Dr. Oetker in London and Vantage Foods in Belleville, to expanding existing facilities such as Fiera Foods in Toronto, our government is helping to retain a core manufacturing sector here in southern Ontario.

An industry also needs the right talent to sustain growth. FedDev Ontario has helped to provide this ingredient with an investment in the state-of-the-art Craig Richardson Institute of Food Processing Technology at Conestoga College in Cambridge. This institute is

"From investing in new plants such as Dr. Oetker in London and Vantage Foods in Belleville, to expanding existing facilities such as Fiera Foods in Toronto, our government is helping to retain a core manufacturing sector here in southern Ontario."
–Goodyear

providing a real-life work environment designed to help graduates understand the entire food production process from raw materials to finished, packaged products.

FedDev Ontario will build upon this strong foundation with additional funding provided in Economic Action Plan 2013.

In December, I launched the Southern Ontario Prosperity Initiatives (SOPIs), which will provide more than $530 million over five years, beginning in April.

The SOPIs are designed to help make the region globally competitive by:

- Investing in business innovation;
- Investing in business growth and productivity;
- Investing in commercialization partnerships; and
- Investing in regional diversification.

These initiatives, created based on feedback from stakeholders, build on the agency's successes to-date and reinforce a continued commitment to building a strong and prosperous southern Ontario.

In particular, for the food and beverage processing sector, they provide opportunities to invest more in machinery and equipment, adopt new technology and processes, increase productivity, diversify markets, and access more R&D to bring innovation from the lab to the marketplace.

In addition, I recently launched the $200-million Advanced Manufacturing Fund. The fund, delivered across Ontario, will promote continued growth of the province's advanced manufacturing sector by supporting large-scale, transformative manufacturing activities.

All of this programming, along with the right partnerships, will accelerate business growth and innovation, increase exports, attract more investment, and create new jobs. Although I can't have you all over for dinner, I believe these factors will combine to create the best recipe for the long-term economic prosperity of the food and beverage processing sector in southern Ontario. This, in turn, will contribute to the economic prosperity of this country.

For more information, I invite you to visit the Agency's website at www.FedDevOntario.gc.ca or call the toll-free number at 1-866-593-5505. For more general information on federal business-related services and programs, I encourage you to visit Canada Business Ontario at www.cbo-eco.gc.ca or call 1-888-576-4444.

I truly believe that we are stronger, more productive and more successful when the public and private sectors work together

Health Canada's regulatory facelift

Sara Zborovski

Hello and welcome to the Regulatory Arena! This regular column will highlight regulatory developments of relevance to the food and beverage industry. And what a year it is going to be for the food industry. Health Canada is in the midst of a "modernization makeover" and as a result, significant change is on the horizon.

Health Canada's current modernization efforts are focused on: food inspection and safety; the regulations as a whole; and the requirements for food labelling. Certain themes are common to all of the efforts, and change is being driven by the realities of the changed ("new") food industry. The industry is innovative, and requires regulations that can keep up with emerging science and technology. In addition, consumers are demanding more information on food labels and it seems lately, everyone is focused on food safety.

THE REGULATION OF FOOD IN CANADA

In Canada, the manufacture and sale of food is regulated by the federal government. Health Canada, the Canadian Food Inspection Agency (CFIA) and Agriculture and Agri-Food Canada each play a role in developing and enforcing the regulatory environment for food in Canada.

The *Food and Drugs Act* and its *Regulations* address the safety and nutritional quality of food sold in Canada. Health Canada is responsible for setting standards relating to the health, safety and nutrition of food. The CFIA enforces Health Canada's standards and administers and enforces non-health and safety standards, which are set out in a number of different acts and regulations. These acts and regulations create a patchwork of requirements, many of which are out-of-date and at times inconsistent with each other.

FOOD INSPECTION MODERNIZATION: WHERE WE'RE AT

In 2011, the federal budget committed $100 million over five years to the "Improved Food Inspection Model", with the goal of improving Canada's food safety system.

In November 2012, a cornerstone of the Food Inspection Model, the *Safe Food for Canadians Act* (SFCA) received Royal Assent. The SFCA consolidates four Acts and 13 federal food inspection regulations made under them. This consolidation reduces the patchwork of requirements referenced above, and it extends the reach of this omnibus food safety legislation to include all food that is imported, exported and prepared for inter-provincial trade.

Throughout 2013, the CFIA consulted with industry and stakeholders on the SFCA and through these consultations, we learned about some elements of the proposed regulatory framework.

One of the core tenets of the regime imposed by the SFCA is a robust system for licensing. Licensing and registration are not new to the food industry and are currently required in some cases. The biggest proposed changes are with respect to the scope of companies that would be required to be licensed (all regulated parties who import food or prepare it for inter-provincial trade) and the movement away from government registration of establishments.

One requirement for issuance of a license will be the development, implementation and maintenance of a preventive control plan (PCP). And because all the scope of parties required to be licensed is increased, so too is the scope of parties required to develop and implement a PCP.

The proposed framework mandates a traceability system which is at a minimum compliant with the Codex Alimentarius international standard and provides a new regulation making authority respecting product recalls.

The CFIA has announced that in "Spring 2014" it will release a Notice of Intent containing a discussion draft of the proposed new regulations under the SFCA. The CFIA will then seek input from industry and stakeholders on the draft regulations, and may also release guidance documents on specific aspects of the proposed new framework. The agency is targeting the end of 2014 for final publication of the regulations and their coming into force at the beginning of 2015. So, lots to come on the food inspection modernization front in the months to come.

FOOD REGULATORY MODERNIZATION: WHERE WE'RE AT

The regulatory modernization project includes review of food-related regulations beyond just those directed to inspection and safety. Health Canada is streamlining a wide array of existing regulations to reduce redundancies and inconsistencies. The goal is to improve compliance by industry, and design a regulatory framework that can keep up with scientific and technical developments.

One of the most welcomed changes has been the recent amendments allowing for Marketing Authorizations (MAs) and Incorporation by Reference (IbR). These new tools allow for faster marketing of new products and label claims by improving efficiencies and have been welcomed by industry.

FOOD LABELLING MODERNIZATION: WHERE WE'RE AT

In addition to the above, the CFIA is developing a more modern food labelling system. Similar themes are driving change here as well: the food industry is innovative, the current requirements are inconsistent and make industry compliance difficult, and consumers want more information.

CFIA is conducting a detailed review of existing provisions to determine which requirements are still relevant and which have become outdated. The food labelling modernization initiative is ongoing, and we can expect to see draft recommendations and options in the upcoming months, following which there will be a further opportunity for CFIA to consult with industry and stakeholders.

And with that summary of the lay of the land, this column will provide updates on the happenings at Health Canada. Feel free to reach out if there is something specific you would like to read about. For more regular updates, please visit my blog: www.thefoodlawyer.ca

Current perspectives

ON THE MICROBIOLOGICAL SAFETY OF FRESH PRODUCE

Kevin Allen[1] | Pascal Delaquis[2]*

FOODBORNE ILLNESS ASSOCIATED WITH FRESH PRODUCE

Analysis of recent epidemiological data reveals that sporadic infections and full-blown outbreaks associated with the consumption of fresh fruits and vegetables contaminated with viral, bacterial or protozoan pathogens are occurring with increasing frequency in Western countries[1]. Some commodities are now recognized as important vehicles for the transmission of foodborne pathogens. For example, leafy green vegetables are a leading cause of infections with Escherichia coli O157:H7[2]. Other commodities not previously associated with the dissemination of microbiological hazards, such as tomatoes and melons, have caused large outbreaks leading to serious threats to public health, loss of consumer confidence and substantial economic disruption. Several factors are believed responsible for this significant shift in the causality of foodborne illness, including increasing intake and variety of fresh fruits and vegetables in the diet, changes in primary production systems and agricultural practices, declining health of the agricultural environment, rapid expansion of the minimally processed (fresh-cut) sector and the growing complexity and length of supply and distribution chains. Producers, processors, wholesale distributors, retailers and regulatory agencies have responded vigorously to consumer concerns about the microbiological safety of fresh produce. Strategies for the control of microbiological contamination are increasingly deployed at ostensibly vulnerable stages along the production-to-consumption chain in conjunction with quality control or surveillance programs on regional or national scales to verify their performance. Such measures clearly alleviate risks to consumers. However, persistent reports of illness hint at weaknesses in current strategies for the control of foodborne pathogens in fresh produce.

DEFICIENCIES IN CURRENT STRATEGIES FOR THE ENHANCEMENT OF FRESH PRODUCE SAFETY

Effective disinfection treatments could clearly eliminate food safety risks before fresh fruits and vegetables reach consumers. Although irradiation can reliably inactivate human pathogens in fresh produce, examples of successful commercial applications are scarce. Several technical, economic and socio-cultural factors have hindered uptake of irradiation technology by the food industry[4]. Consumer unwillingness to purchase irradiated food, whether a false perception or not, is an intangible risk that few food companies are either able or willing to assume. None of the alternative chemical or physical disinfection approaches proposed to date can deliver the antimicrobial efficacy or retention of eating quality achieved with irradiation. In the absence of an effective "kill step" the prevention of contamination and, where bacterial pathogens are concerned, reduction of opportunities for growth remain the focus of mitigation measures. The principles and approach inherent to Hazard Analysis Critical Control Point (HACCP) are increasingly applied to fresh produce production, processing and distribution systems to achieve these objectives. Science-based HACCP programs are developed through the recognition, quantification, assessment and ranking of risks associated with potential hazards to identify critical control points (CCPs) at specific stages along the production-to-consumption chain. The safety of many foods derived from well-characterized processing systems is ensured through the application of reliable HACCP programs, notably where inputs can be stringently controlled or where an effective kill step is applied. In contrast, the principles of HACCP are not easily adapted to the development of food safety programs for fresh produce. Factors that influence the fate of human pathogens are rarely constant due to the inherent complexity, variability and unpredictability of fresh produce chains. In addition, critical gaps in knowledge or the scarcity of relevant data often hinder the recognition of hazards, the assessment of implied risks or their ranking to identify and prioritize CCPs. Strategic research on the origin, characteristics, distribution and fate of human pathogens in fresh produce chains is clearly needed address these deficiencies.

SELECTED CRITICAL KNOWLEDGE GAPS AND RESEARCH NEEDS

Undesirable microorganisms may enter fresh produce at many stages before and after harvest. Potential sources of contamination in relatively enclosed postharvest handling, processing and distribution operations are generally recognizable and controllable. In contrast, most production systems are open and subject to frequent known or latent microbiological risks that are difficult to rank and control. Here the microbiological quality of irrigation water stands out as an example of a challenge to the assessment and ranking of risks needed for the identification of CCPs. Natural irrigation water supplies such as rivers, lakes or reservoirs designed for the purpose are subject to contamination with variable and often unpredictable sources of microorganisms, including foodborne pathogens. Given that large volumes may be applied repeatedly to growing crops, irrigation water could introduce significant risks, specifically where pollution by animal or human wastes cannot be completely prevented. Reports from many parts of the world indicate that foodborne pathogens are often detected in supplies used for irrigation, albeit at very low concentrations. Unfortunately, the risks implied by very low numbers of foodborne pathogens applied to crops over the course of a production cycle are difficult to measure. Despite this uncertainty irrigation water quality is often considered a CCP requiring monitoring and control. Monitoring is currently expensive given the number of analyses required to ensure the performance of a testing program. Rapid, low cost methods or technologies for the detection of foodborne pathogens in water are urgently needed to improve the scope and validity of irrigation water quality monitoring. Where control is required producers are faced with serious challenges given the increasing scarcity of alternative natural supply options or lack of access to treated water in remote agricultural areas. Field deployable water treatment systems that can accommodate the volumes required for crop irrigation purposes would clearly contribute significantly to the reduction of risks associated with the microbiological quality of irrigation water.

Fresh fruits and vegetables are increasingly delivered to end-users in a fresh-cut format. Water containing an antimicrobial agent (chlorine based compounds, peroxyacetic acid, ozone or hydrogen peroxide) is routinely used to wash either the whole plant or cut tissues before packaging. Washing in sanitizer is widely considered a CCP as some of the microorganisms associated with produce surfaces may be inactivated by the treatment. Properly applied sanitizers can prevent cross-contamination during the wash step but their efficacy against surface-bound contaminants is limited and the tolerances which signal the need for corrective action for this CCP are narrow. Microorganisms located within recessed or damaged plant tissues are believed to remain protected from the effects of sanitizers. Attempts to improve the antimicrobial efficacy of washes using other chemicals, either alone or in combination with emulsifiers or ultrasound, have met with little success. Alternative physical treatments such as ultraviolet light, high powered pulsed light, cold plasma or application of antimicrobials in the gas phase are more likely to overcome the limitations inherent to sanitizing solutions and enhance the destruction of microorganisms on plant surfaces. All are the subject of considerable research at the present time.

Bacterial pathogens including Salmonella spp., Escherichia coli O157:H7 or Listeria monocytogenes are capable of growth in a range of fresh-cut products including leafy vegetables, apple slices or melon cubes. Since current processing schemes cannot ensure complete removal of contaminants, the maintenance of low temperature remains the only barrier to bacterial proliferation during distribution. Recent investigations have shown that temperature can fluctuate substantially in commercial distribution chains. An integrated study of the fresh-cut lettuce distribution chain in Canada showed that temperatures above the minimum required for growth of the pathogen Escherichia coli O157:H7 can occur during transportation between storage at processing plants, distribution centres and retail outlets[3]. However, the risk implied by disruptions in temperature control during the distribution of fresh produce remains difficult to estimate due to the limited amount of available data at this juncture. In addition, the influence of consumer practices on the risk of pathogen transfer or growth remains highly speculative due to the dearth of studies on food handling behaviour in the home.

FUTURE PROSPECTS

Accurate assessments of risks along integrated fresh produce chains using conventional scientific approaches would require inoculation of products with foodborne pathogens to measure pathogen survival or growth at each stage. Because biosafety issues preclude experimentation with human pathogens in a commercial setting, mathematical modeling using laboratory-derived data is increasingly used to predict pathogen behaviour at different stages including production[5], processing[6], storage of fresh-cut products[7] and in distribution chains for fresh produce[8]. The capacity to predict risks associated with individual stages paves the way for simulation of pathogen behaviour in complete chains and increasingly accurate ranking of risks for identification of CCPs. These advances will undoubtedly lead to the development of more effective HACCP programs and guide the development of improved control strategies focused on control of key microbiological hazards in fresh produce.

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Food allergens and the Canadian Food Chain –

WORKING TOWARD A SAFER FOOD SUPPLY

Joyce Irene Boye*

Food hypersensitivity, which includes food allergy and food intolerance, affects many Canadians and is a subject of growing health concern. Approximately 3-4% of adults and 5-6% of children reportedly suffer from food allergy (Samson 2004, 2005; Ben-Shoshan et al., 2010). Although often used interchangeably, food allergy and food intolerance are different types of food reactions. Food intolerance is an adverse food reaction that does not involve the immune system but which may induce an idiosyncratic, metabolic or toxic response to a food (e.g., lactose intolerance). Symptoms can include gastrointestinal distress (e.g., gas, cramps, bloating and pain), heartburn, irritability and headaches. Food allergy, on the other hand, is an immunological reaction resulting from the ingestion, inhalation or atopic contact of a food or additive. Symptoms of food allergy are varied and may include skin rash, hives, swelling of the eyes, face, lips, tongue and throat, itching, migraines, nausea, diarrhea, vomiting, cramps, and in some cases anaphylactic shock or death. The eight major priority allergens responsible for over ninety percent of food allergic reactions are milk, egg, peanuts, tree nuts (almonds, Brazil nuts, cashew, hazelnuts, macadamia nuts, pecans, pine nuts, pistachios, walnuts), fish, crustacean shellfish, soy and wheat. In Canada, mustard and sesame are also considered as priority allergens, along with sulphite food additives (e.g., potassium bisulphite, sodium metabisulphite, etc) (www.hc-sc.gc.ca/fn-an/securit/allerg/index-eng.php). Although sulphites do not elicit true allergic reactions, the symptoms they provoke in sensitized individuals are very similar to true food allergic reactions.

Gluten sensitive enteropathy (GSE) (commonly referred to as celiac disease) is another abnormal immunological response to gluten/gliadin in genetically susceptible individuals which results in a diseased state frequently characterised by damage of the lining of the gut (i.e., villous atrophy) (Fasano & Catassi, 2001). Whereas symptoms of celiac disease are typically associated with damage of the intestinal tract, symptoms such as diarrhea, anemia, weight loss, vomiting, poor appetite, gas, bone pain, behavioural changes, muscle cramps, fatigue, ulcers and tooth discoloration have been reported. Foods responsible for GSE are gluten containing cereals (i.e, wheat, barley, rye, triticale, spelt and kamut). Research in the last few years suggests that oat is safe for most GSE patients; it is, however, included in the list of gluten containing foods in Canada. Manufacturing practices used in commercial oat production often result in the contamination of oat with other gluten containing grain. Special production practices are required to ensure that oat is free of celiac-provoking gluten proteins. Some oat products labelled as free from these grains are marketed today for celiac patients (e.g., Pure Oats).

Food-dependent exercise induced anaphylaxis (FDEIA) is another form of food allergy induced by exercise. FDEIA is unique in that the food or exercise alone does not provoke an allergic reaction but the combination provokes an allergic response. The precise pathophysiology is poorly understood and symptoms can include urticaria, respiratory and gastrointestinal manifestations, angioedema, hypotension and shock (Horne & Lin, 2008). Various foods have been implicated such as wheat, soy, shellfish and peanuts.

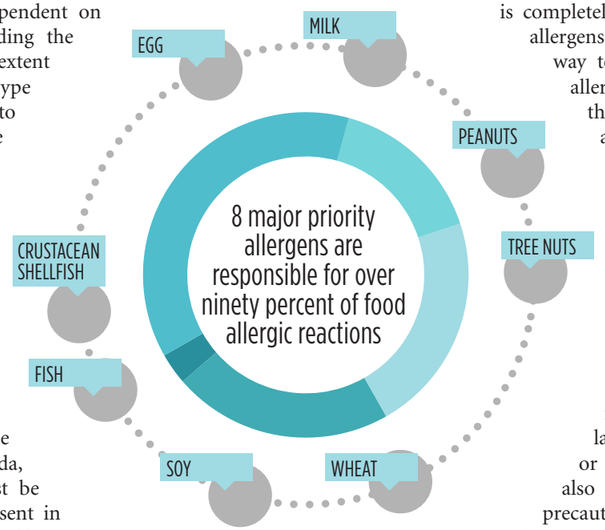
LABELLING OF FOOD ALLERGENS

The prevalence of food hypersensitivity appears to be on the rise (Osterballe et al., 2005). Due to the severity of allergic reactions and the social costs for allergy sufferers many countries have established regulations to protect allergic consumers. In Canada, Health Canada requires that all prepackaged foods containing priority allergens be clearly labelled using commonly used words for these allergens (e.g., "wheat" or "egg"). The allergen may be indicated in the list of ingredients or in a "contains"

statement immediately following the list of ingredients. When listed as an ingredient, the common name of the allergen must also be used (e.g., INGREDIENTS: Potatoes, wheat starch, corn oil, salt, seasoning (milk), sulphites). If manufacturers elect to state the allergens in a "contains statement" then they must list all allergens present in the food including sulphites if present at 10 ppm and above (e.g., INGREDIENTS: Potatoes, wheat starch, corn oil, salt, seasoning CONTAINS: milk, wheat, sulphites). Allergens present in wines and spirits and wax coatings must also be declared. The only prepackaged foods exempt from allergen labelling are highly refined oils (except peanut oil). Processing treatment used for highly refined oils removes residual allergen provoking proteins. Unrefined or semi-refined oils may contain the protein fraction of the seeds from which they are derived and so must be avoided by allergy sufferers and companies making food products intended to be free of these allergens. Whenever peanut oil is used, however, Health Canada requires that the source of the oil "peanut", be always identified. Common names for plant sources of hydrolyzed protein must also be declared on all pre-packaged foods.

ALLERGEN THRESHOLD OR ELICITING DOSE

The minimal amount of food required to provoke an allergic reaction is described as the threshold dose or eliciting dose. This dose varies significantly between allergy sufferers and is dependent on a variety of factors including the nature of the allergen, the extent to which it is processed, the type of processing it is subjected to and the food matrix at the time of consumption. This makes it very difficult to set an acceptable limit for the presence of allergens in foods. Efforts are underway to develop models from clinical data to allow such limits to be set. A few countries, including Australia and New Zealand, have set threshold limits for some allergenic foods. In Canada, sulphites for example must be labelled when they are present in foods at levels greater than 10 parts per million. Health Canada has also determined that for most people suffering from GSE, a level of 20 ppm provides adequate protection and so foods containing up to 20 ppm may be labelled as gluten free. A similar recommendation has been made by the Codex Alimentarius for gluten-free food labelling. In Canada, Health Canada defines gluten as any gluten protein or any modified gluten protein, including any gluten protein fraction, that is derived from the grains of barley, oats, rye, triticale, wheat, kamut and spelt, or grains of hybridized strains created from these.



ALLERGEN MANAGEMENT DURING PROCESSING

Avoiding allergens in the food supply is challenging for the food industry. Successful avoidance requires an understanding of the sources of allergens in the food chain and a good allergen management program. Crops grown in proximity to one another and harvested with the same equipment without appropriate cleaning could introduce allergens during production and primary processing. Ingredients used in food processing, if not properly sourced, could contain undeclared allergens. Lack of appropriate cleaning procedures in between processing of different products could introduce allergens in prepackaged foods. Rework, which involves reusing or reprocessing of unincorporated food product with new products, could introduce allergens into lines intended to be allergen-free. Indeed, waiting until a food is completely processed before testing for allergens may not be the most efficient way to ensure a food is free from allergens. From formulation to the sourcing of ingredients and at every stage of processing, precautionary steps need to be taken to ensure that the introduction of undesired allergens is avoided.

PRECAUTIONARY LABELLING

Some food industries have attempted to manage the presence of allergens in their foods by using precautionary labelling (e.g., may contain, or processed in a facility that also produces "X"). Whereas these precautionary statements may be useful, their overuse by food manufacturers has resulted in a decrease in consumer confidence and in some instances disregard of the precautionary statements which puts the health of consumers at risk. Health Canada has recently made revisions to its guidelines for precautionary statements use. While this remains voluntary, Health Canada recommends that the only statement used be "may contain [X]", where X is the name by which the allergen is commonly known. Precautionary statements should only be used when the inadvertent presence of allergens can't be avoided. Companies are therefore expected to have made every effort to avoid the presence of allergens whenever this statement is used.

ALLERGEN TESTING IN FOODS

Depending on how it is used, allergen testing may be used as part of a robust allergen management program. A wide variety of allergen test kits which are capable of detecting allergens at very low ppm levels are available on the market today. For accurate detection of allergens, appropriate test kits must be used (e.g., a food to be tested for the presence of whey protein should be analysed with a kit detecting total milk protein or beta-lactoglobulin and not casein). Processing can influence allergen detection. As a result, some manufacturers have developed kits to address specific challenges with processed foods (e.g., high tannins in chocolate which makes proteins difficult to extract; gluten proteins which require a special extraction buffer; egg which aggregates when cooked and may be difficult to extract). Recent studies by Gomaa et al. (2012) and Gomaa and Boye (2013) reported marked decreases in allergen recovery after cooking of some foods and in some instance false negatives were recorded. A false negative detected by an allergen kit does not, however, indicate that the food is safe. Allergenic epitopes (i.e., parts of the protein that provoke allergic reactions) may be liberated after being hydrolysed by enzymes in the gastrointestinal tract which can result in the provocation of an allergic reaction. The processing method used, including temperature and processing time, as well as product size can significantly affect allergen detection and quantification. The method used for allergen detection, therefore, needs to be carefully selected as it can have an impact on allergen recovery. Using appropriate reference materials, buffers and extraction procedures is necessary to ensure accurate detection of food allergens.

CONCLUSION

Food allergy will likely continue to be a problem into the foreseeable future. Health Canada has provided regulations to ensure that allergic sufferers are protected. The Canadian food industry must remain vigilante and keep abreast of best practices to allow them to comply with regulations while offering consumers a variety of safe and nutritious foods. In addition to the priority allergens, some fruits, vegetables, pulses may also provoke allergic reaction. While these are not currently regulated, it is important that the food industry be aware of them as there may be opportunity to develop niche food products to capture these markets. The allergen-free food market presents tremendous market opportunity and with the right information and know-how, the Canadian food sector can position itself to take advantage of this growing market.

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Food Inspection Analyses –

SAFETY IN NUMBERS?

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Guaranteeing the safety of the foodsupply in Canada continues to prove challenging to industry and government. Food safety cannot be "regulated" into food and new approaches are required to support the production of safe meat products. Recognition by processors that "a culture" of food safety is the best strategy to drive enduring improvement has not achieved the level of ownership necessary. With the introduction of the Safe Foods for Canadians Act, the CFIA will attempt to re-think its options to more effectively protect the public. While it is unlikely that absolute safety offood is attainable, it is possible that with enlightened understanding and insightful approaches risks can be contained within acceptable limits. The meat industry will be used to illustrate common problems.

THE SAFE FOODS FOR CANADIANS ACT

With passage of the *Safe Foods for Canadians Act* (SFCA) in November 2012, the CFIA has embarked on an ambitious plan to modernize the federal food inspection system. The primary goal of the new Act is to consolidate the federal meat, fish, and agricultural products inspection legislation in one place and broaden oversight of imported foods by capturing those not covered by the Acts. However, it will not affect the 30% or so of foods we buy, including those that are sold locally within the province or territory of their origin. Basic legislation underpinning the safety of all food in Canada (*The Food and Drugs Act* and regulations) has remained unchanged, and although its revision has been high on the priority list of Health Canada for the last decade, parliamentary support has been lacking.

The focus of the SFCA will be on prevention and require all processors trading food inter-provincially and internationally to be licensed and have preventive food safety control plans (PCPs) such as Hazard Analysis Critical Control Points (HACCP) or an equivalent program in place. As an overarching principle, HACCP programs can only be successful in a company with a strong business food safety culture[4]. It may be possible that within the new proposed risk management framework, industry will have the flexibility to set food safety objectives and determine how these will be met. However, industry does not always have the proper tools and guidance needed to carry out a proper hazard analysis and initiate a comprehensive PCP. A European study of HACCP plans by multinational food companies identified errors in identification of hazards as well as underestimation of hazard severity and improper identification of critical control points (CCPs) which were related to inexperience of the HACCP teams4. This problem is unresolved and must be addressed even though the regulators (CFIA, USDA) are moving away from formally accepted food safety programs in favour of less prescriptive, but more outcome-based programs.

The SFCA will require those regulated to have a PCP in place, not just establishments processing meat, poultry and fish. Since the new inspection models will be outcome-based rather than prescriptive, evidence supporting PCP effectiveness must be provided by industry. This represents a significant departure from the unequally applied CFIA policy requiring HACCP recognition. For commodities where HACCP is not mandated (dairy, eggs, maple and honey products), its adoption has been less than satisfactory, in part, because of the broken promise that use of such a system would reduce the frequency of industry end-product testing required by regulatory agencies. Since sampling costs have not been reduced as anticipated by HACCP adoption, industry has not embraced, and infrequently takes ownership of these programs. Zero tolerance for pathogens in raw foods is an extension of this philosophy and represents an attempt by the USDA and the CFIA to be seen as taking steps to protect public health. Six more serotypes of E. coli were recently added to the adulterant list for fresh ground beef in the US and Salmonella and Listeria monocytogenes are probably not far behind. Such action will engender endless additional end product testing which is without scientific value in predicting the safety of food.

MICROBIOLOGICAL TESTING AND SAFETY

Microbiological testing is one way to verify whether a food safety risk management system is performing as expected [3]. As the tolerated frequency or concentration of pathogens such as Listeria monocytogenes in ready to eat (RTE) meat and E. coli O157:H7 in raw meat is far less than 1%, it is not practical to determine compliance by microbiological testing alone. Microbiological criteria should be established in concert with good hygienic practices and operation of critical control points (HACCP) to yield compliance with a food safety objective[3]. The microbiological criteria for beef carcasses and raw beef intended for producing finished raw ground beef product, called precursor material (PM), requires that E. coli O157:H7 be below the limit of detection when tested by approved methods.

TABLE 1.
Sample size required/month to assure with 95% confidence that E. coli 0157:H7 occurrence will be less than 0.1% of product units[2]

Lot size (animals slaughtered/month)	Sample size at 0.1% threshold
10-69	all
500	499
1,000	950
5,100	2,265
9,700	2,576
28,200	2,841
100,000	2,950

Federally regulated slaughter establishments must use at least one pathogen reduction strategy to reduce E. coli O157 below the limit of detection and the intervention step, or the final step if multiple interventions are used, must be managed by a CCP[2]. The CCP must be validated by microbiological testing of carcasses over a 4 month period during the season with highest expected prevalence. Sampling plans are based on an expected prevalence of E. coli O157 of 0.1% in raw beef products[2], which means that the sample size required to provide 95% confidence that product will be below 0.1% positive for E. coli O157 is quite large (Table 1).

Furthermore, for verification of the CCP, one carcass must be sampled every 1 to 3 months, depending on the volume of the slaughter facility. With an expected prevalence of 0.1%, the probability of recovering E. coli O157 is impossibly low. Therefore, a negative result for E. coli O157, especially from a single sample, doesn't guarantee that E. coli O157 is absent from the lot. If sampling of PM yields > 5% positive E. coli O157 samples at the 95% confidence level, the CFIA requires that processors investigate the high event period and take corrective action. Processors may choose to set their targets at a more stringent level to increase the confidence that a non-conforming lot is detected and rejected. As the concentration of the pathogen declines, the confidence in results obtained from microbiological testing also declines. If E. coli O157 is present at a level of 1 cell per kg of ground beef and 5 subsamples of 200 g are collected, then theoretically one cell will be present in every 5th sample. If the presence of E. coli O157 is reduced to 1 cell per 10, 100 or 1000 kg, one cell will present in one in 50, 500 or 5000 samples, respectively. If pathogens are clustered together, rather than evenly dispersed, detection is further obscured.

Pathogen testing to validate HACCP systems is not informative as the data are based on their presence rather than their number. Microbiological testing for HACCP purposes is much more valuable when indicator organisms such as total aerobic bacteria, coliforms, Enterobacteriaceae, generic E. coli, fecal streptococci, aeromonads or generic Listeria are quantified, so changes in numbers can be tracked and trends established[1]. An effective HACCP program will progressively reduce indicator organisms to the lowest possible level. Methods are capable of enumerating indicator organisms at one viable cell per sample, when large surface areas (1000 cm^2 or larger) are sampled by swabbing[1]. The latter authors suggested that use of performance objectives (POs) for indicator organism was

superior to POs for pathogens as numbers can be measured and targets set with confidence to achieve desired levels. The numbers of generic E. coli that can be recovered from carcasses has dropped to <1/10,000 cm^2 and from beef cuts to <1/100 cm^2 [5]. With such low numbers of generic E. coli on meat, end product testing for pathogens becomes even less useful in predicting the safety of meat.

A NEW CROSS-COMMODITY INSPECTION SYSTEM

The SFCA plan for uniform assessment of commodities provides a unique opportunity to assign the inspection resource to where it is most needed. However, the requirement for a single inspector to have sufficient multi-commodity experience to insightfully assess performance of meat, fish, dairy and vegetable plants is an expectation fraught with new difficulty. Currently, inspector knowledge and training is a contentious issue from the perspective of industry. While requirements for uniform inspection and consistency in oversight response have been catalysts driving the proposed inspection models, overestimate of expectations will further undermine inspector credibility and that of the Agency very quickly. The recent CFIA announcement that roving Inspection Verification Teams (IVTs) would confirm PCP operation by unannounced audits, do trend analysis and ensure consistent inspector performance across the country, acknowledges that today's inspection system, where inspectors have single commodity specific responsibility, has shortcomings. How will this improve when inspectors have responsibility for more than one commodity? Since the client will be responsible for decisions by the resident inspector not upheld by the IVT, plant closures can occur without warning. It should be recognized by the CFIA that by proactively ensuring adequate inspector training there is no need for IVTs. Indeed, it is the CFIA that has responsibility to employ adequately trained employees; regulated parties have primary responsibility for food safety.

CONCLUSION

The impact of the SFCA on meat safety in Canada will not be evident until the regulatory changes are implemented (early 2015). Although there is some promise from a more science-based approach to inspection, the current move towards more microbiological testing of finished products is unjustified and not supported by the science of sampling. While the CFIA has a lot on its plate developing the regulations for the SFCA, so do Canadians. We put 36 billion meals a year on the table only to find that 3-6 million of them cause illness. The SFCA provides an opportunity to change these statistics, but this is only likely to happen if risk-based inspection models are soundly based on science and experience.

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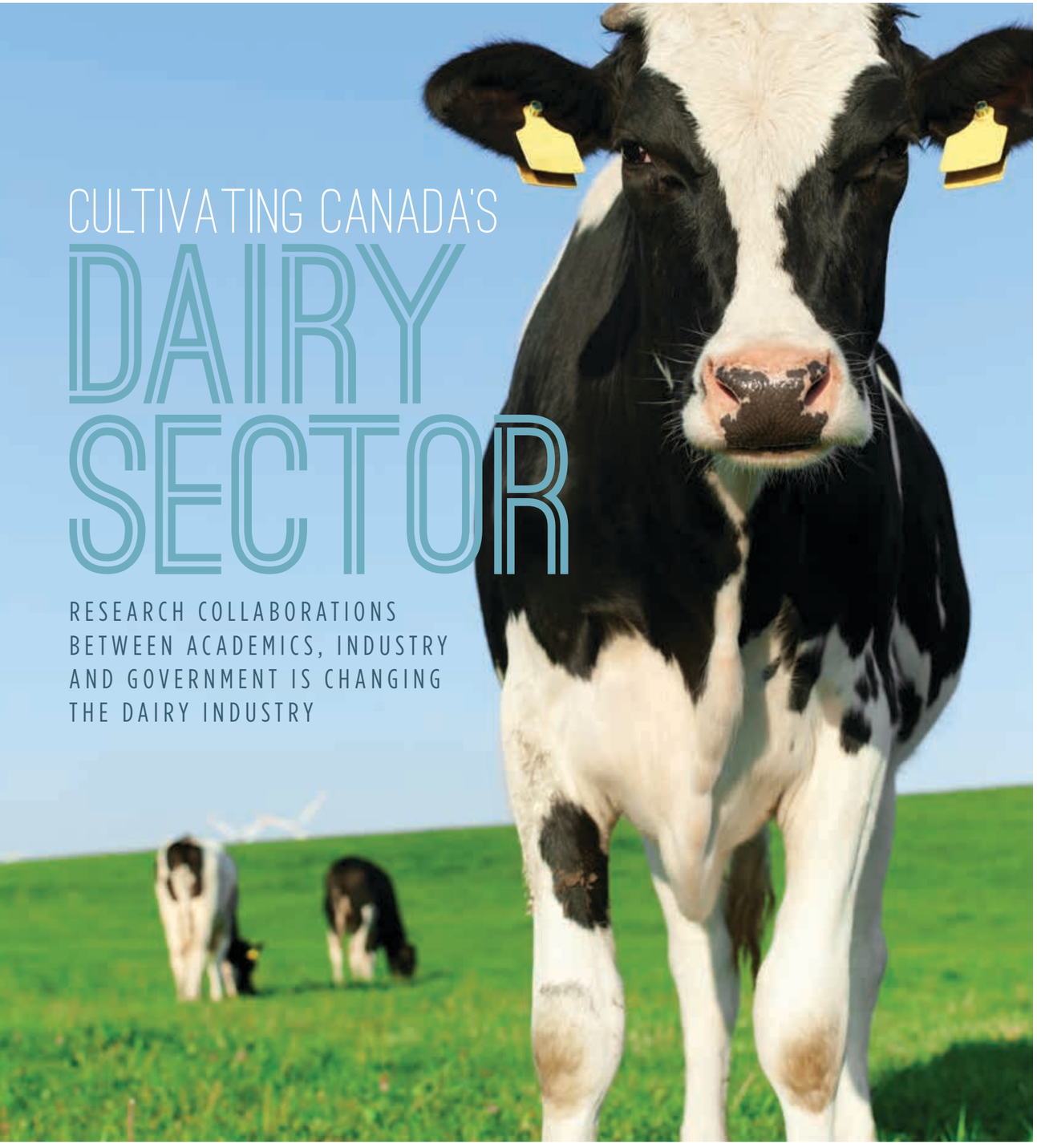

CULTIVATING CANADA'S DAIRY SECTOR

RESEARCH COLLABORATIONS BETWEEN ACADEMICS, INDUSTRY AND GOVERNMENT IS CHANGING THE DAIRY INDUSTRY

Text by Lindsay Grummett

Scattered across the Canadian countryside from Vancouver Island to Logy Bay, Nfld., are nearly 13,000 dairy cattle farms that are home to just over 960,000 dairy cows. A typical dairy farm in Canada is a family-owned operation with a herd of about 77 Holstein cows.

Dairy is one of the top two agricultural sectors in seven provinces and contributed $16.2 billion to the GDP in 2011, according to the Dairy Farmers of Canada (DFC). The DFC is a farmer-funded organization with a mission to promote and defend the interests of dairy producers while also ensuring an economically viable environment. The organization acts as a unified voice for the sector.

"Dairy Farmers of Canada brings together all dairy farmers across Canada and is responsible for the lobbying, policy and promotion of dairy products," says Shelley Crabtree, the communications officer for the Dairy Research Cluster, a research initiative funded in part by the DFC.

The collective success of the sector is, of course, sustained by the hardworking men and women who rise early and head to their barns and jobs at the processing plants each morning, but it's also due in part to the efforts of organizations like the DFC, the Canadian Dairy Commission and Agriculture and Agri-Foods Canada who are collaborating to better the sector with programs like the Dairy Research Cluster.

"The cluster is streamlining industry research priorities. It's bringing together 15 universities, eight government research centres and over 100 scientists," says Crabtree. "This research is for improving and innovating dairy farms."

Investments in dairy research can help to improve on-farm practices, market development, and product innovation, all of which contribute to a healthy and sustainable dairy sector. Research advancements could have long-term impacts and improve not only the quality of milk, but also Canada's reputation as the top dairy producer in the world.

FOR THE FARMER

It's 6 AM and Dave Taylor's been doing chores in the barn for over an hour. He has 120 milking cows at the farm located in the Comox Valley on Vancouver Island and with his father now retired, the success of the business is in the hands of both Taylor and his brother. "We've had 10 calves in the last seven days so it's been pretty busy around here," he says.

In addition to running the farm, Taylor is also the chairperson for the BC Dairy Association (BCDA), a group that provincially promotes milk through marketing and education. The BCDA also acts as a lobby organization for provincial dairy producers, and each of the provinces have their own organization that represents their specific concerns. "We meet with government and position dairy farms before them so they can get to know our sector. It's important that they are aware we're small businesses trying to contribute to the Canadian economy."

While the provincial lobby organizations work to improve the local sector, the Dairy Farmers of Canada acts as a collective voice of the nation's farmers. It is also one of the biggest supporters of dairy research. Starting in 2010, the DFC along with the Dairy Research Commission and Agriculture and Agri-Foods Canada began investing in a new program called the Dairy Research Cluster which was launched as part of the Canadian Agri-Science Cluster Initiative.

The first half of the initiative, which ran from 2010 to 2013, focused on innovative health and nutrition as well as sustainable development. "The objective of these research clusters is to bring together some of the best scientists in the country and have them work together and focus in on some of the major themes," says Crabtree.

THE CLUSTER IS STREAMLINING INDUSTRY RESEARCH PRIORITIES. IT'S BRINGING TOGETHER 15 UNIVERSITIES, EIGHT GOVERNMENT RESEARCH CENTRES AND OVER 100 SCIENTISTS

Close to $12 million was invested in the Dairy Research Cluster with Agriculture and Agri-Foods Canada pitching in $7.5 million, the DFC contributing $3 million and additional funding coming from the CDC and Natural Sciences and Engineering Research Council of Canada. A total of 48 research projects received funding and each focused on specific concerns that could offer tangible benefits. For example, researchers at Laval University looked into the reduction of sodium in cheese while Dr. Carol Henry at the University of Saskatchewan studied the impact of removing chocolate milk from schools on student's overall nutrient intake.

"We had great results coming out of areas like lifecycle assessment, milk production and animal health and welfare," says Crabtree. "There are some really fantastic results in animal care and the continuation of which in phase two will bring to light a lot of tools we can deliver to farmers."

Twenty-three projects are included in the second phase of the program, Dairy Research Cluster II, which runs from 2013 to 2018 and will receive a total of $18.8 million in funding. The overall objective is to promote the efficiency and sustainability of Canadian dairy farms, grow markets and supply safe, high quality products. Crabtree says that innovation is nothing new to farmers who are keen to learn about progressive technology and research.

"Dairy farmers have been investing in research for several decades now," says Crabtree. "It's always been a part of their program: to innovate, get better, be more efficient on farms and produce the best milk possible."

DRINK UP

What if we had the potential to build better cows? To develop an

animal that is stronger, taller in stature and possesses all the qualities of an ideal dairy cow? We do.

"It's called traditional selection and it's been done for the last 50 years or so," says Dr. Filippo Miglior, chief of research and strategic development at the Canadian Dairy Network. "You choose your best animals and select them to carry on the next generation. In every generation we can make improvements because we're choosing the animal with the best genes to carry that trait on."

Although traditional selection isn't new, Miglior and his research partner, Dr. Milena Corredig, are hoping to build on this concept to improve the milk's nutritional quality and to do so they are using existing dairy infrastructure and technology.

Canadian milk goes through rigorous testing on a regular basis to ensure its safety and quality. In Ontario, the Agriculture and Food Laboratory (AFL) at the University of Guelph tests representative samples from virtually every Ontario farm's bulk milk tanks for both composition and quality. Laboratory technicians use infrared technology to perform the compositional analysis of the milk for fat and protein. The information is then used to determine how much money is owed to the farmer since their pay is based on the product's components as well the quality of milk. "They measure fat and protein percentages in milk, which are important to milk payment, but also for genetic improvement," says Miglior.

Dr. Filippo Miglior, chief of research and strategic development at the Canadian Dairy Network.

Dr. Milena Corredig, University of Guelph professor and Ontario Dairy Council research chair.

The infrared technology that is used to determine fat and protein percentages can also be used to measure other components such as fatty acids, minerals and lactoferrin, a nutriceutical property in milk that can aid the immune system.

Miglior and Corredig are using the AFL's milk sample data to predict these alternative properties. The results could have huge impacts on the dairy products and milk payments, but the research process is strenuous and time-consuming. "For fatty acids, we would use gas chromatography. It would take about one hour per vial (of milk) while [AFL technicians] do maybe 1,000 vials in an hour for fat and protein."

Miglior and Corredig will use this small sample of data to create a prediction equation that can be used on all milk-recorded animals. This means if the researchers genotype between 5,000 and 10,000 animals for this project, the information they retrieve can be applied to the other 200,000 genotyped cows even if they weren't specifically measured for a trait like fatty acids. Then, once the animals are evaluated, genomic selection can begin. Cows could potential be bred to offer specialty milk that features fatty acids, minerals and lactoferrin. If this process occurs, Miglior says Canadian milk could become more appealing in the North American market because it will be richer and healthier than milk from our southern neighbours.

"The science gives us the ability to identify those animals so the industry can adapt. This is an opportunity for Canada to be at the forefront of the milk industry with naturally selected animals and no genetic modification (GM)," says Miglior. "This is a natural way that allows us to make progress."

Dairy milk imports currently account for 15 per cent or $440 million of the Canadian milk market. Innovative improvements to the components of milk could be exactly what the industry needs to capture back that share of the market.

FROM LAB TO FARM

Farmers are continuously adapting to the changing landscape of the industry and research is understood to be a cornerstone for success. The Dairy Research Cluster II provides farmers with quarterly updates about research online through the Canadian Dairy Research Portal and every year representatives from each of the provinces attends a research symposium where study results are shared with the industry.

"This is where we see innovation and advancement," says Taylor, who attended last year's conference in Toronto as a representative for BCDA. "These are things our industry can look at and potentially use down the road."

Dairy Research Cluster II isn't the only program offering assistance to the dairy sector. Canadian Dairy Commission has a $6 million Matching Investment Fund (MIF) which is designed to encourage innovation in the manufacture and use of dairy products and ingredients while the Canadian Dairy Network's DairyGen provides financial support to genetic researchers.

"The research that they're funding is not for the researchers, it's for improving and innovating the dairy sector. In the end, the farmers know the outcomes will benefit them on the farms," says Crabtree.

Innovation will be a necessity to combat the increasingly difficult industry terrain. Roughly 35 years ago, Canada's dairy industry produced 14 per cent more milk per capita than the U.S., but as of 2011, it produced 21 per cent less. But Canada's focus on quality over quantity and innovation over short-term solutions places the country in a good position for global recognition.

"Our quality of milk is among the best in the world and there's a lot of great innovation happening on dairy farms," says Crabtree. "Canadian dairy farmers are striving to be the best dairy producers in the world and they're doing pretty good."

CHEF ANNA OLSON

Text by Lindsay Grummett

Celebrity chef Anna Olson's love of baking began with her grandmother, a woman she describes as having a passion for baking to share with others. Olson picked up this passion and made into a successful profession.

After studying culinary arts at Johnson & Wales University in Colorado, she moved back to Canada to work as a pastry chef. Olson's culinary philosophy is based on a common-sense approach to cooking and baking with the seasons. Although many of her culinary creations are rich and decadent, she advocates balanced eating and loves to include fresh, locally-sourced ingredients in her recipes.

Over the last 10 years, she's authored seven bestselling cookbooks and hosted a series of hit television shows that have aired across the globe. Olson can currently be found on Food Network Canada's *Bake with Anna Olson* where she teaches the audience baking techniques while making everything from cheesecake to chocolate pastry.

WHAT INSPIRED YOU TO BECOME A PASTRY CHEF?

In terms of my love of baking, my original inspiration was my grandmother. Her passion for baking to share rubbed off on me. But my love for baking is simply that culinary exploration. I studied culinary, not baking, in school but it was the science and precision of baking that drew me in.

WHAT'S BEEN THE MOST EXCITING MOMENT IN YOUR CAREER SO FAR?

Starting my career on television was probably the most life-changing but also scariest. I still get very nervous in front of the camera, but it creates opportunities through networking and events. Before, I couldn't imagine that getting in front of a camera and fighting my own nerves to talk about blueberry buckle, crepes and tortes would lead to other things.

WHAT'S YOUR FAVOURITE MEAL TO MAKE?

I'm a seasonally motivated cook so I can't pick just one thing, but if it were for spring or summer, it's got to be grilled items. I love a grilled rib-eye steak on a charcoal barbecue with a ripe tomato salad that has sliced red onions, fresh raspberries, blue cheese and then depending on what time of year, I'll add in some extras.

WHAT WOULD YOU SAY IS THE MOST UNDERRATED PASTRY?

The croissant. We all identify it with French cuisine, but what we typically get here in North America is just a shadow of the true French croissant.

WHAT IS THE HARDEST PART OF DEVELOPING A NEW RECIPE?

Pushing the boundaries. It takes practice to know when you can bend the rules and when you've pushed them too far, but that said, you learn from your mistakes and then you make a better recipe.

YOU MAKE AN EFFORT TO PROMOTE NUTRITION AND BALANCED EATING, WHY IS THAT IMPORTANT FOR YOU?

I don't believe we should deprive ourselves from treats. If you're making those sweet things from quality ingredients, respecting the seasons and using what's at its best, then it's going to be far more satisfying and you don't need that third, fourth and fifth portion for it to be fulfilling. If you take things out of your diet, you'll end up missing it and eating more.

IF YOU WEREN'T A CHEF, WHAT WOULD YOU BE DOING?

I would either write an award-winning fiction novel or be a dance DJ like Deadmau5. I could wear a giant chef's hat over my head!

WHAT LETS YOU BRING COUNTLESS FLAVOURS TO LIFE?

ALMONDS, OF COURSE.

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