

Canadian Technological Roadmap on Functional Foods and Nutraceuticals

Sections 1 to 6

September 2002



Canadian Technological Roadmap on Functional Foods and Nutraceuticals

Section 1

Markets

September 2002



World Market

- In 2000, the nutrition products world market was evaluated at US \$138 billion according to the Nutrition Business Journal (NBJ)

World Market 1997 - 2000

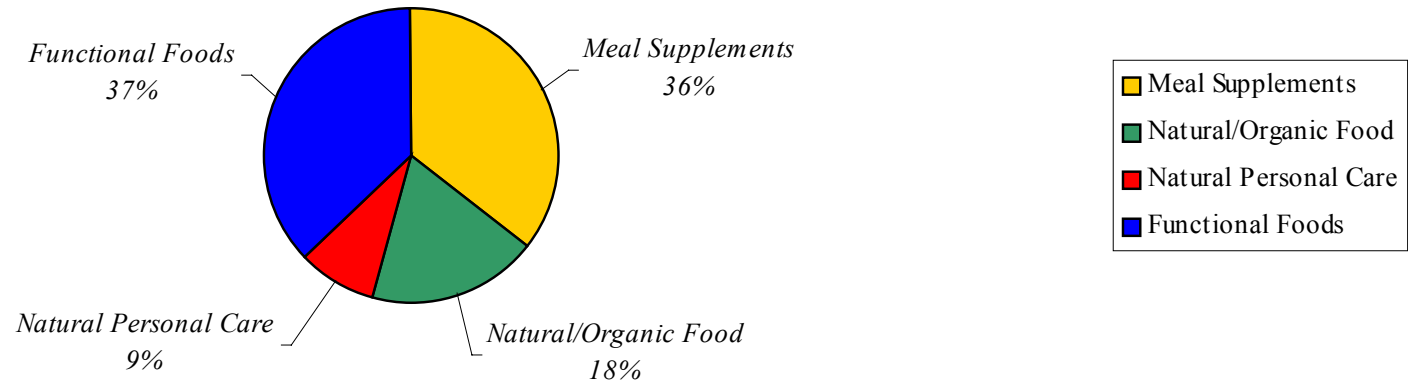
	1997	1998	1999	2000	Growth in 01-03
	(US \$ million)	(US \$ million)	(US \$ million)	(US \$ million)	
<i>Vitamins & Minerals</i>	18 000	16 870	19 620	20 440	3,0%
<i>Herbs / Botanicals</i>	15 990	18 980	17 490	18 070	4,0%
<i>Sports Nutrition</i>	8 760	9 310	9 960	10 710	7,0%
Supplements Total	42 750	45 160	47 070	49 220	4,0%
Natural / Organic Food	16 690	19 910	22 700	25 420	11,0%
Natural Personal Care	9 620	10 280	11 020	11 850	7,0%
Functional Foods	40 320	43 940	47 670	51 480	8,0%
Nutrition Industry	109 380	119 290	128 460	137 970	7,0%

Growth	97-98	98-99	99-00
<i>Vitamins & Minerals</i>	-6,3%	16,3%	4,2%
<i>Herbs / Botanicals</i>	18,7%	-7,9%	3,3%
<i>Sports Nutrition</i>	6,3%	7,0%	7,5%
Supplements Total	5,6%	4,2%	4,6%
Natural / Organic Food	19,3%	14,0%	12,0%
Natural Personal Care	6,9%	7,2%	7,5%
Functional Foods	9,0%	8,5%	8,0%
Nutrition Industry	9,1%	7,7%	7,4%

World Market

- In 2000, the functional foods market was still the most significant on a worldwide scale with sales of US \$51 billion
- In 1999, the functional foods' most significant segment was bakery with sales of almost US \$10 billion

1999 World Market Distribution



World Market

- The world market continues its progression. The fundamental indicators at the origin of the market's growth of Functional Foods and Nutraceuticals (FFN) will ensure growth for the coming years:
 - Governments' tendency toward a preventive approach as regards to public health
 - Health costs increasingly higher
 - Aging of population in the industrialized countries
 - Baby-Boomers (Desire to maintain their health and their activities)
 - Consumer attraction for alternative products
 - Increased consumer awareness and healthier way of life (the self-care movement)
 - Better quality products supported scientifically, and a more effective marketing
 - Increased interest from large companies associated to this industry's development



World Market

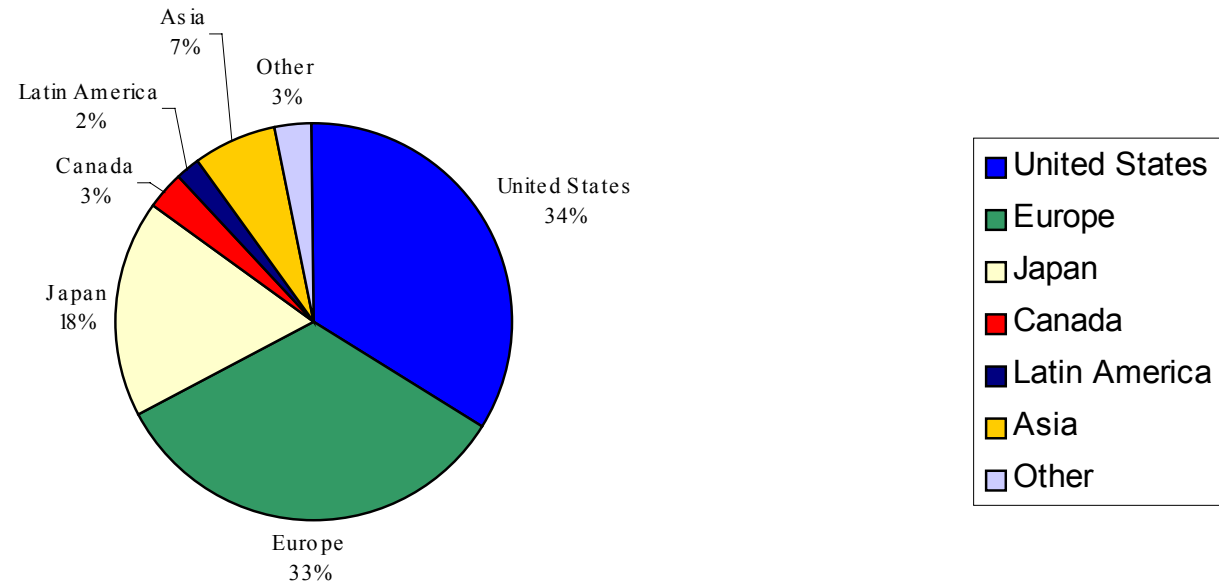
- Certain elements will have the effect of consolidating this market on a worldwide scale:
 - An effective regulatory framework ensuring the public's protection and companies' interest in various markets
 - A greater uniformity of regulations permitting access to the markets
 - An increase in quality standards and scientific credibility associated to the products
 - A market niche transposition towards a mass market
- For the moment, the regulations and quality standards' levels of maturity are significant factors associated to the deceleration of market growth
- Factors which also affect the demand from various geographical markets are: culture, consumer awareness, level of schooling, age and income



World Market

- The United States constitute the principal market, and represented 34% of the world demand in 1999

Distribution of Nutritional Products by Area in 1999



World Market

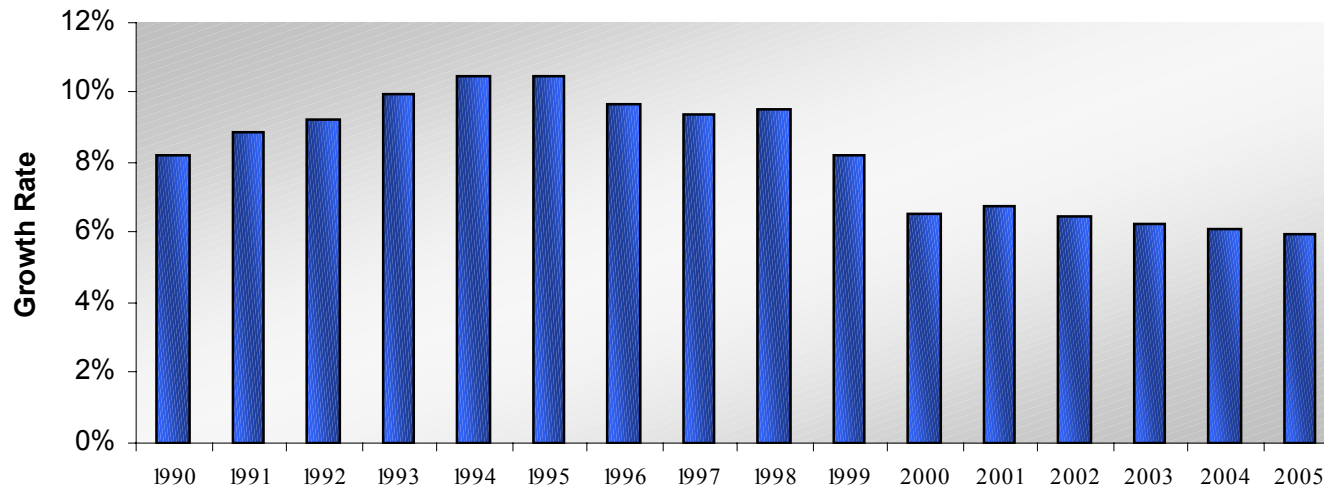
Worldwide Industry on Nutrition:

- Many FFN producers are affiliated with larger food or pharmaceutical companies
- In general, the pharmaceutical industry is in a better position to produce nutraceuticals, and the food industry is in a better position to produce functional foods
- Leaders from large food and pharmaceutical companies, such as Kellogg, Heinz, Quaker, Unilever, Dupont, Novartis, Cargill, Hormel, Abott Laboratories, Royal Numico, Amway and American Home Products, are active in this field because they consider the market to be very promising
- Japanese, Asian and European inhabitants are more receptive to FFN because of their historical former use of natural medicinal products

American Market

Nutrition Market:

Annual Growth of the Nutrition Industry in the United States 1990 - 2005



- The growth, which was 8 to 10% during the years 1990 to 1999, has now an annual average growth of a little more than 6%, and this, until 2005

American Market

- The market growth decline of the last years is explained, notably, by a reduction in the sales of supplements related to:
 - Poor quality of certain products
 - A lack of scientific support relatively to certain benefits
 - Bad press on certain products
- The nutrition industry continued to grow due to the following factors:
 - An aging population, who is more fortunate, is motivated to adopt a healthier lifestyle and focused on self medication
 - A greater acceptance and more recommendations by the medical community for the supplements and health food
 - A greater emphasis on the prevention and maintenance of health
 - A growth of complementary and alternate medicines
 - An industry characterized by a better science, a better quality product and companies which spend more on marketing



American Market

- The United States constitute the principal market. This country represented 36% of the world market in 2000, that is to say US \$49.5 billion were distributed in the following way:

United States Nutrition Industry Performance from 1998 to 2000

Products	1998 (US \$ million)	1999 (US \$ million)	2000 (US \$ million)	01-04 Growth Forecast	1999 Growth	2000 Growth
Vitamins	5.610	5.780	5.850	2-4%	3.0%	1.3%
Herbs / Botanicals	3.960	4.070	4.120	2-4%	2.8%	1.2%
Sports Nutrition	1.340	1.450	1.590	6-8%	8.2%	9.7%
Minerals	1.140	1.290	1.350	2-4%	13.2%	4.7%
Meal Supplements	1.840	1.970	2.140	6-8%	7.1%	8.6%
Specialty / Other	1.210	1.500	1.680	8-10%	24%	12%
Supplements Total	15.100	16.060	16.730	3-5%	6.4%	4.2%
Natural / Organic Food	9.780	10.770	11.800	8-10%	10%	9.6%
Functional Foods	14.780	16.080	17.210	6-8%	8.8%	7.0%
Natural Personal Care	3.290	3.590	3.800	6-8%	9.1%	5.8%
Nutrition Industry	42.950	46.500	49.540	6-7%	8.3%	6.5%
Sales Channels	1989 (US \$ million)	1999 (US \$ million)	2000 (US \$ million)	Forecast	1999 Growth	2000 Growth
Retail-NHF, etc.	13.550	14.720	15.890	6-8%	8.6%	7.9%
Retail-MM	22.440	24.450	25.940	5-7%	9.0%	6.1%
Mail Order	1.100	1.130	1.220	2-4%	2.7%	8.0%
Multi-Level / Network	4.810	4.920	4.940	0-2%	2.3%	0.4%
Practitioner	950	1.110	1.250	10-12%	17%	13%
Internet	60	180	300	20-30%	200%	67%
Totals	42.910	46.510	49.540	6-7%	8.3%	6.5%

Source: Nutrition Business Journal, (<http://www.nutritionbusiness.com>), derived from a variety of sources. Forecast is annual average, 2001 NBJ and Penton Media Inc.

American Market

- Nutritional bars increased by 23% in 2000, and now represent a US \$1 billion market, which considerably increased the functional foods' growth
- Energy drink sales increased by 10%
- Soya derived products increased in all categories, such as: supplements, functional foods and whole foods. Soya supplement sales increased by 70% in 2000. Moreover, the sales of soya milk increased by 25%, totalling US \$640 million, according to the NBJ
- Sporting nutrition and weight loss products represented, in 2000, US \$8.65 billion, which is an increase of 12.4%. This figure is equivalent to 17% of US \$49.7 billion of the United States' nutrition industry. The NBJ predicts a growth in this sector of 9.9% per year for the years 2001 to 2004

American Market

- In 2000, the organic food market reached sales of US \$5.8 billion, an increase of 19%. The organic products now account for 49% of the total sales of the “Natural and Organic Products” sector. According to the NBJ, the organic products will occupy 80% of this sector in 2006
- The five herbs mostly sold in the United States are: ginkgo biloba, echinacea, garlic, ginseng and St. John’s Wort. Botany supplement sales are estimated at US \$4.2 billion by the NBJ in 2000



American Market

- The most frequent applications of supplements containing plants by way of remedy are: cold, influenza, tiredness, stress, depression, angina, allergies, amnesia, anxiety and immune system insufficiency
- In the United States, 25% of pharmaceutical products are derived from plants:
 - According to the World Health Organization's estimates, there exists more than 20,000 medicinal plants and 4,000 drugs made from plants
 - Asia and Japan combined constitute the most significant market with sales of approximately US \$7.3 billion



American Market

Nutrition Industry:

- There are more than 85 supplement manufacturers in the United States
- 20% of them monopolize 70% of the income on the American market
- The five most significant manufacturers are:

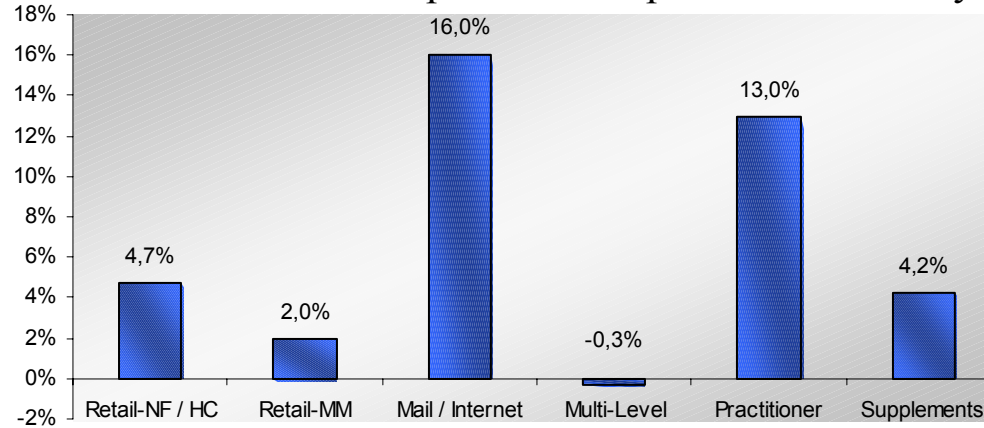
Supplement Manufacturers in the United States

Manufacturer	Head Office	State	Income from supplements in 2000 (US \$ million)
Royal Numico	Boca Raton	Florida	939
American Home Products	Madison	New Jersey	480
Leiner Health Products	Carson	California	463
Unilever (Slim Fast)	West Palm Beach	Florida	385
Pharmavite	San Fernando	California	360

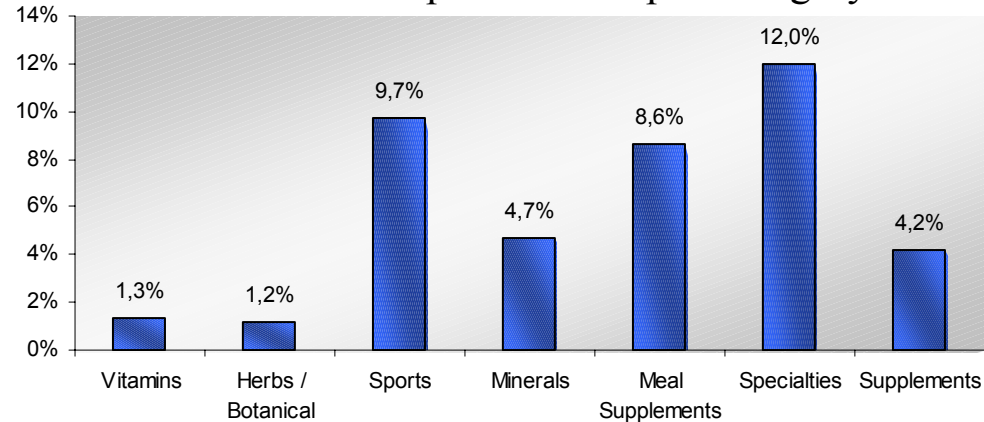
American Market

- Supplement sales in 2000 in the United States

Supplement Sales Growth Representation per Distribution System



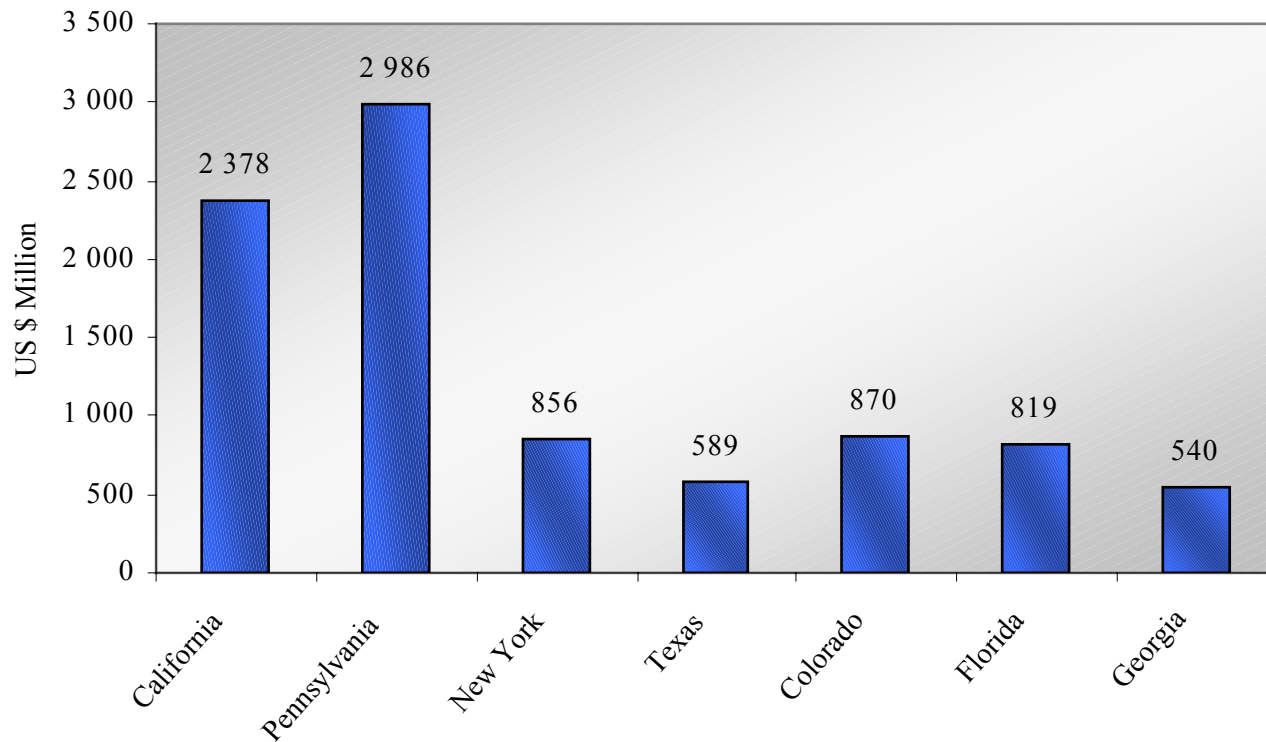
Supplement Sales Growth Representation per Category



American Market

- Principal markets in the United States: retail - dietetic and health product stores

Retail Sales – Dietetic and Health Products

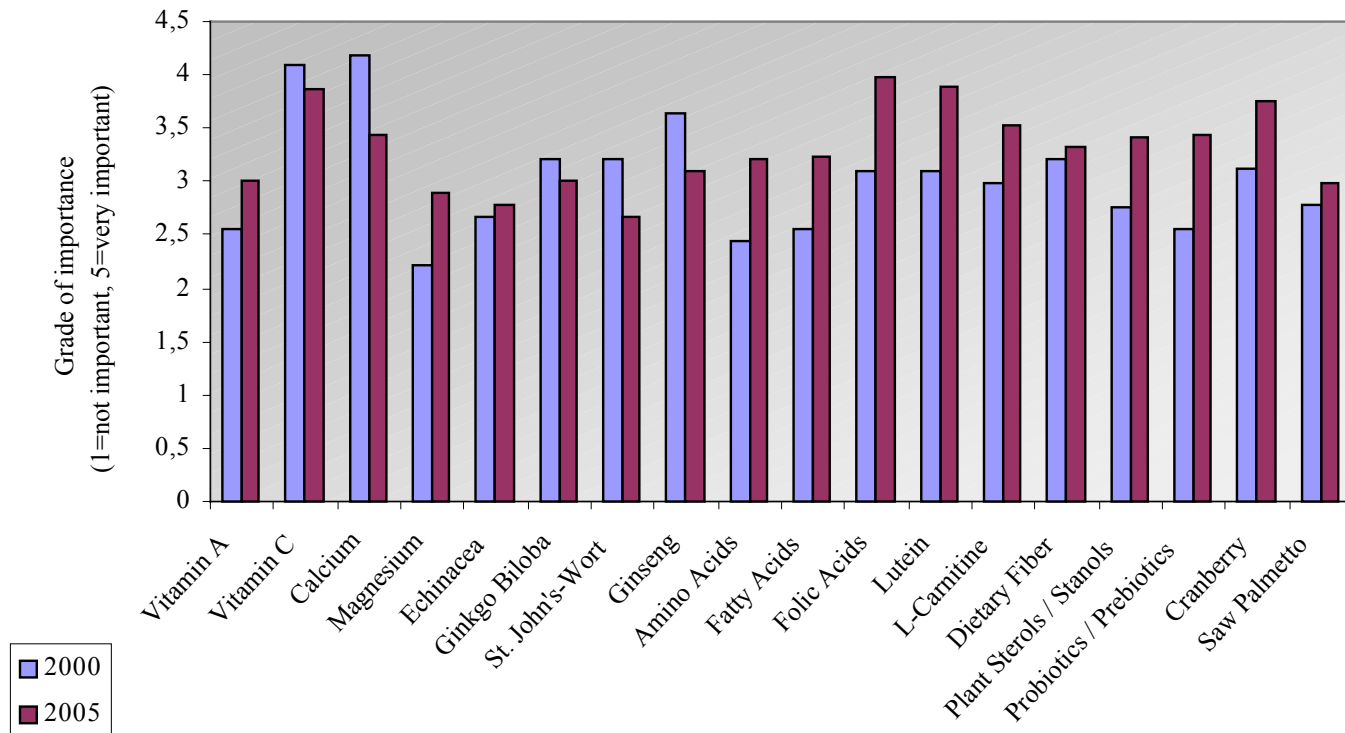


Source: SIC code 5499. Specialized food retail sales establishments including: Health and dietetic food stores, dietetic foods, health foods, vitamin food stores. (<http://www.zapdata.com>), Dunn and Bradstreet 2001.

American Market

- Nutraceutical growth prospects in the United States for the period of 2000 - 2005

Nutraceutical Growth Prospects in the United States



Source: Datamonitor, 2001 U.S. Nutraceuticals.

American Market

- Nutraceuticals which will increase its volume for the period of 2000 to 2005, according to the study carried out by Datamonitor, will be the probiotics/prebiotics with an increase of 34% followed by the amino acids with an increase of 32%, and magnesium with 31%
- The heavy losses will mostly affect calcium by 18%, St-John' s-Wort by 17% and ginseng by 15%

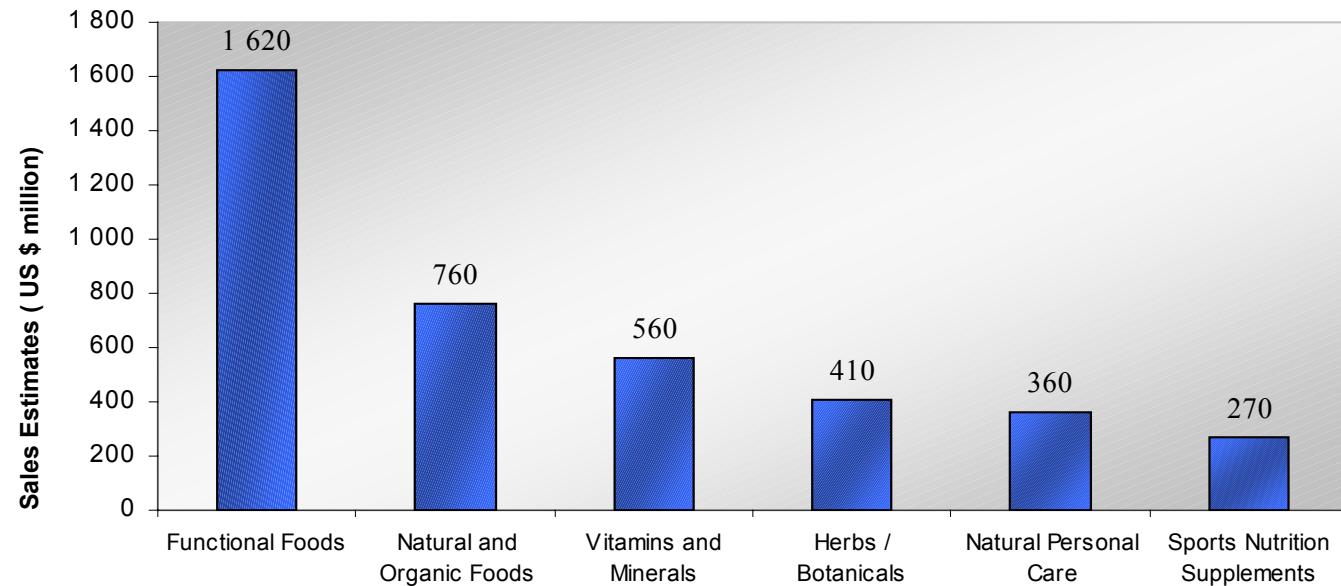


Canadian Market

Nutrition Market:

- In 2000, the Canadian market was at US \$3,980 million representing nearly 3% of the global market

Canadian Nutrition Market in 2000



Canadian Market

- As in the United States, the sectors showing the greatest growth are in natural health products, herbs and botanical products
- The herb/botanical supplement sector showed a growth of 24% between 1996 and 1998 in Canada (Lapsley, 1998)
- More than 1.5 million Canadians substituted their prescriptions with natural health products, which cost less (Canadian Health Monitor, June - July 1997)
- Natural health products sold in Canada in 1997 represented CA \$1.2 billion, an increase of 20% since 1995
- Sales of vitamins, herbs and supplements represent 60% of total sales

Canadian Market

- An unprecedented number of Canadians consume vitamins, minerals and food supplements containing plant extracts to prevent disease, prolong life, preserve energy and improve quality of life
- According to the CTV/Angus Reid Group, between 1992 and 1997, the use of alternative medicine showed an increase of 81%
- The most popular herbs/botanicals with Canadians are echinacea and garlic



Canadian Market

Nutrition Industry:

- In 1998, a total of 120 companies could be counted in the nutraceutical sector. Ontario held approximately 25% of the industry, while British Columbia and Quebec held 22%

Size of the Canadian Nutraceutical Industry

Company Size (CA \$)	Number of Companies	% of Companies on the Market	Average Income (CA \$)	Average Number of Employees	Average R&D (CA \$)	Total Sales (CA \$)	% of the Industry's Sales
< \$1 M	20	17	500 000	20	870 000	10 000 000	0,5%
\$1 M to \$9,999,999	63	53	3 100 000	50	940 000	197 000 000	8,0%
\$10 M to \$49,000,000	20	17	32 000 000	130	1 200 000	637 000 000	25,0%
> \$50 M	17	14	100 000 000	710	3 300 000	1 667 000 000	66,5%

Canadian Market

- In 2002, the present study counts some 215 companies geographically divided as follows:

Companies listed geographically

	Number of Companies	% of Companies in Each Province
Alberta	15	7%
British Columbia	47	22%
Manitoba	7	3%
New Brunswick	2	1%
Newfoundland	6	3%
Nova Scotia	7	3%
Ontario	52	24%
Prince Edward Island	4	2%
Quebec	49	23%
Saskatchewan	26	12%
Total	215	100%

Source: Functional foods and nutraceutical product technology in Canada, Agriculture and Agri-Food Canada, (<http://www.contactcanada.com>) (data banks), Saskatchewan Nutraceutical Network Directory, Edition 2001/2002, Directory of Canadian exporters of ingredients, Agriculture and Agri-Food Canada.

Canadian Market

- The Canadian market represents 3% of the world market
- The absence of a precise regulatory framework was a factor limiting the development of the market and of Canadian companies¹
- The FFN Canadian industry is directed towards technological development ownerships to find and market specific ingredients having beneficial effects on certain diseases or on physiological conditions¹
- The Canadian companies must show technological leadership in this priority market in order to compete with the American candidates of more significant size
- Canada profits from an excellent reputation in the field of nutritive products that are beneficial to health¹, the FFN Canadian industry is able to ensure a better positioning on a world level as long as the efforts to structure the industry are maintained

1. Shambrock Consulting Group Inc., Nutraceutical and Functional Food Industry Survey Think Tank, Report summary addressed to Agriculture and Agri-Food Canada, March 2002 (<http://www.agr.gc.ca/food/nff>).

Canadian Technological Roadmap on Functional Foods and Nutraceuticals

Section 2

Regulatory Framework

September 2002



Regulatory Framework

- Since the United States *Dietary Supplements Health Education Act*, the Canadian industry has urged the government to set rules in order to be competitive in the marketplace with American manufacturers
- Recently, Health Canada proposed a new regulatory framework related to the FFN industry:
 - *Regulations amending the Food and Drug Regulations* (Nutrition Labeling, Nutrition Claims, Health Claims)
 - *Natural Health Products Regulations*
- These regulations will increase opportunities on the local market and increase the competitiveness of our industry even if there is still an ongoing consultation on the issue of specific authorization of health claims for foods (Refer to the Canadian Regulatory Framework, herein)



Regulatory Framework

- The business practices are similar (Good Manufacturing Practices, Good Clinical Practices and scientific documentation in support) in the United States and in Canada¹
- Differences in the two regulatory frameworks are:
 - Fourteen generic health claims for foods and dietary supplements are allowed in the United States², five generic health claims for foods in Canada
 - Access to market seems quicker in the United States compared to Canada:
 - 30 days notification under the DSHEA (US)
 - Health Canada authorization prior to product marketing and selling
- The Canadian consumer will benefit from a more rigid control but the process implemented by Health Canada has to be clear and efficient for the growth of our industry
- Efficiency of the process also means a collaboration with the stakeholders of this industry (researchers, health professionals, regulatory people, industry, consumers)

1. Source: Various guidelines published by Food and Drug Administration, and the new regulatory framework in Canada, Refer to the American and Canadian Regulatory Framework, herein.

2. Appendix A.

American Regulatory Framework

- “Terms such as ‘functional foods’ or ‘nutraceuticals’ are widely used in the market place. Such foods are regulated by *Food and Drug Administration* (FDA) under the authority of the *Federal Food Drug and Cosmetic Act*, even though they are not specifically defined by law.”¹
- FDA definition of a health claim:
 - “Health claim means any claim made on the label or in labeling of a food, including a dietary supplement, ..., including ‘third party’ references, written statements, ..., symbols, ..., or vignettes, characterizes the relationship of any substance to a disease or health-related condition.” (*Code of Federal Regulations*, Title 21, Vol.2, Section 101.14(a)(1))
 - The *Nutrition Labeling and Education Act* (NLEA) (1990) has a more precise definition which states that a claim relative to health “characterizes the relationship between a nutrient and a disease or a health-related condition, ...”
- “There are three categories of claims that can be used on foods and dietary supplement labels: health claims, structure/function claims, and nutrient content claims. The responsibility for ensuring the validity of these claims rests with the manufacturer, FDA, or, in the case of advertising, with the *Federal Trade Commission*.”²

1. Source: Center for Food Safety & Applied Nutrition, Food Labeling and Nutrition, (<http://www.cfsan.fda.gov/label.html>).

2. Source: FDA, Office of Nutritional Products, Labeling, and Dietary Supplements. “Claims That Can Be Made for Conventional Foods and Dietary Supplements”, October 2001.

American Regulatory Framework

Types of Claims in the United States

Types of food and dietary supplement health claims	Acts
Health Claims	<i>Nutrition Labeling and Education Act (NLEA)</i>
	<i>Food and Drug Administration Modernization Act (FDAMA)</i>
Structure/Function Claims	<i>Dietary Supplements Health Education Act (DSHEA)</i>
Nutrient Content Claims	<i>Nutrition Labeling and Education Act (NLEA)</i> <i>Food and Drug Administration Modernization Act (FDAMA)</i>



American Regulatory Framework

- **Health Claims**¹ There are two ways by which FDA exercises its oversight in determining which health claims may be used on a label or in labeling for a food or dietary supplement:
 - 1990 NLEA: Modifies the *Federal Food Drug and Cosmetic Act*. The FDA can authorize a health claim for a food or dietary supplement based on its careful review of the scientific literature. Twelve health claims² were thus granted in the United States
 - 1997 FDAMA: Modifies the *Federal Food Drug and Cosmetic Act*. The FDA authorizes distributors and manufacturers to use health claims or claims regarding the nutritional value if they are backed by up-to-date information, published and documented by specific scientific federal organisms³
 - To obtain an authorization by the FDA, according to the FDAMA, a manufacturer must inform it at least 120 days prior to its product marketing. If during this time, FDA disapproves the authorization for an unspecified reason, the claim cannot be made on the product label

1. Source: FDA, Office of Nutritional Products, Labeling, and Dietary Supplements. “Claims That Can Be Made for Conventional Foods and Dietary Supplements”, October 2001.
2. Source: FDA, Centre for Food Safety and Applied Nutrition. “A Food Labeling Guide—Appendix C”, November 2000, see Appendix A.
3. Source: FDA, Office of Food Labeling. “Notification of a Health Claim or Nutrient Content Claim Based on an Authoritative Statement of a Scientific Body”, June 1998.

American Regulatory Framework

- Until now and by using the following procedure, two types of claims were approved by the FDA:
 - “Whole Grain Foods and Risk of Heart Disease, and Certain Cancers
 - Potassium and the Risk of High Blood Pressure, and Stroke”¹
- The health claim authorization request must include the following elements²:
 - Support of clinical data
 - An explanation of the therapeutic advantage gotten by the food component in the total food
 - The bond between the food component and a certain health condition
 - Documentation showing that the food preserves its original nutritive and sensory functions
 - Proof that the consumed quantities justifying the claim do not present a health risk

1. Source: FDA, Centre for Food Safety and Applied Nutrition. “A Food Labeling Guide – Appendix C”, November 2000.

2. Source: FDA, Office of Special Nutritionals. “Guidance for Industry Significant Agreement in the Review of Health Claims for Conventional Foods and Dietary Supplements”, December 1999.



American Regulatory Framework

- **Structure/Function Claims¹** – The 1994 *Dietary Supplements Health Education Act* (DSHEA) created another category of statements, generally referred to as “structure/function” claims that may be made for dietary supplements
 - The term “dietary supplement” indicates that this product is intended to supplement the diet and bears or contains one or more of the following dietary ingredients:
 - a) a vitamin;
 - b) a mineral;
 - c) an herb or other botanical;
 - d) an amino acid;
 - e) a dietary substance for use by man to supplement the diet by increasing the total dietary intake; or
 - f) a concentrate, metabolite, constituent, extract, or combination of any ingredients described in clauses a), b), c), d), or e)².

1. Source: FDA, Office of Nutritional Products, Labeling, and Dietary Supplements. “Claims That Can Be Made for Conventional Foods and Dietary Supplements”, October 2001.

2. Source: FDA, Public Law 103-417. “Dietary Supplement Health and Education Act of 1994”.

American Regulatory Framework

- These statements may claim:
 - A benefit related to a nutrient deficiency disease, as long as the statement also tells how widespread such a disease is in the United States
 - A description of a nutrient or a dietary ingredient's role intended to affect a structure or function in humans, for example, "calcium builds strong bones"
 - To characterize the means by which a nutrient or dietary ingredient acts to maintain such structure or function, for example, "antioxidants maintain cell integrity", or they may describe general well-being from consumption of a nutrient or dietary ingredient
- "The manufacturer is responsible for ensuring the accuracy and truthfulness of these claims; they are not approved by FDA"
- For this reason, the law states that if a dietary supplement label includes such a claim, it must state in a 'disclaimer' that FDA has not evaluated the claim. The disclaimer must also state that the dietary supplement product is not intended to 'diagnose, treat, cure or prevent any disease,' because only a drug can legally make such a claim



American Regulatory Framework

- Manufacturers of dietary supplements that make structure/function claims on labels or in labeling must submit a notification to FDA no later than 30 days after marketing the dietary supplement that includes the text of the structure/function claim¹
- “Under DSHEA, a firm is responsible for determining that the dietary supplements it manufactures or distributes are safe and that any representations or claims made about them are substantiated by adequate evidence to show that they are not false or misleading. This means that dietary supplements do not need approval from FDA before they are marketed. Except in the case of a new dietary ingredient, ...”²

1. Source: FDA, Office of Nutritional Products, Labeling, and Dietary Supplements. “Claims That Can Be Made for Conventional Foods and Dietary Supplements”, October 2001.
2. Source: FDA, Center for Food Safety and Applied Nutrition. “Overview of Dietary Supplements”, January 2001.



American Regulatory Framework

- **Nutrient Content Claims**¹ – Under NLEA, foods and dietary supplements can use claims called “nutrient content claims”. Nutrient content claims may only be made if FDA has a regulation specifying the criteria that a food must meet in order to use the claim:
 - These claims describe the level of a nutrient or dietary substance in the product, using terms such as “good source”, “high” or “free”
 - With few exceptions, nutrient content claims can only be made for nutrients or dietary substances that have an established daily value
 - The requirements that govern the use of nutrient content claims help ensure that descriptive terms, such as “high” or “low” are used consistently for all types of food products and are thus meaningful to consumers
 - The regulation requires that the food whose claim relates to the nutritional value always carries a nutritional labeling. An additional labeling of desistance and disclosure of the nutritive elements is also required

1. Source: FDA, Office of Nutritional Products, Labeling, and Dietary Supplements. “Claims That Can’t Be Made for Conventional Foods and Dietary Supplements”, October 2001.

American Regulatory Framework

- As it did for health claims, the FDAMA of 1997 provided a second way for a health claim to be used on foods. FDAMA allows certain health claims to be made based on an “authoritative statement” as discussed above for health claims¹
- The FDAMA did approve in the same way, in August 2001, a health content claims for foods containing choline²
- “The definition of ‘drug’ in the *Federal Food Drug and Cosmetic Act* in the United States excludes food when referring to articles intended to affect the structure or function of the body. This differs from the definition of ‘drug’ in the *Canadian Food and Drugs Act* in that foods and drugs are not expressly mutually exclusive. Consequently, the approaches to regulating claims about the effect of a food or food component on a body structure or function will be different between Canada and the United States.”³

1. Source: FDA, Office of Nutritional Products, Labeling, and Dietary Supplements. “Claims That Can’t Be Made for Conventional Foods and Dietary Supplements”, October 2001.

2. Source: FDA, Center for Food Safety and Applied Nutrition. “Nutrient Content Claims Notification for Choline Containing Foods”, August 2001.

3. Source: Health Canada, Bureau of Nutritional Sciences. “Product-Specific Authorization of Health Claims for Foods, A Proposed Regulatory Framework”, October 2001.

Canadian Regulatory Framework

- The Canadian regulatory framework currently in force does not allow that a food be subject to any claim relating to health benefits, and this even if this claim depends on scientific data:
 - “By virtue of Section 3 of the *Food and Drugs Act*, no person may advertise, sell, or represent by label, any food, drug, cosmetic or medical device to the general public as a treatment, preventative or cure for any of the diseases, disorders or abnormal physical states referred to in Schedule A to the Act. Diseases listed in Schedule A are generally those for which professional medical diagnosis and treatment are recommended.”¹
- Health Canada, responsible for the administration of the *Food and Drugs Act*, proposes a new regulatory framework aiming to modify the current system to consider the realities of the functional foods and nutraceuticals sector

1. Source: Health Canada, Bureau of Nutritional Sciences. “Product-Specific Authorization of Health Claims for Foods, A Proposed Regulatory Framework”, October 2001.



Canadian Regulatory Framework

- Two draft Regulations rising from the *Food and Drugs Act* were filed with the House of Commons:
 - Project: “*Regulations Amending the Food and Drug Regulations*” (Nutrition Labeling, Nutrition Claims and Health Claims) targeting functional foods, published in June 2001
 - Project: “*Natural Health Products Regulations*” whose described substances refer more specifically to nutraceuticals, published in January 2002

Regulations Amending the Food and Drug Regulations

- The regulations modify the rules concerning nutritional labeling, nutritional and health claims relative to the food benefits¹
- The regulations aim to improve the current situation on *Food and Drugs Act* because, at present, the use of nutritional labeling in Canada is optional for the majority of foods
- This new project modifies the *Food and Drug Regulations*, which will require more complete nutritional information on the labels of prepackaged foods. It will also permit to update and gather within the regulations the allowed claims relative to the content of nutritive elements. Moreover, the current scientific proof justifies the introduction of a regulatory framework and process for diet-related health claims

1. Source: Canada Gazette, Nutrition Labelling, Nutrition Claims and Health Claims. “Proposed Regulations Amending the 14 Food and Drug Regulations”, June 2001.



Canadian Regulatory Framework

- As regards nutritive claims of foods and labeling¹:
 - The labeling requirements would only apply to prepackaged foods. Any vitamin or mineral nutrient added to the food would have to be declared, as would any nutrient that is subject of a claim
 - The proposed amendments would regulate the compositional criteria and specific labeling requirements for nutrient content claims. The use of alternative terminology (synonyms) for nutrient content claims would be restricted
 - The criteria, which would limit the claims relating to the content of nutritive elements, are enumerated in Appendix B
- Time of transition:
 - To comply with the new proposed regulation, small companies² will have a three year transitional period
 - A two year transitional period is proposed for the remainder of the food industry

1. Source: Canada Gazette, Nutrition Labelling, Nutrition Claims and Health Claims. “Impact Analysis on Regulations Amending the Food and Drug Regulations”, June 2001.

2. A small business would be defined as a manufacturer who had gross revenues from sales of food in Canada of less than CA \$1 million in the 12-month period prior to the coming into force of the proposed regulations.
Source: Canada Gazette, Nutrition Labelling, Nutrition Claims and Health Claims. “Impact Analysis on Regulations Amending the Food and Drug Regulations”, June 2001.

Canadian Regulatory Framework

- As regards health claims related to foods:
 - The generic claims, which will henceforth be allowed, are as follows¹:
 - “sodium, potassium and hypertension
 - calcium, vitamin D and osteoporosis
 - saturated fat, trans fat and heart disease
 - fruits and vegetables, and some types of cancer; and
 - sugar alcohols and dental caries”
 - The manufacturers must check only if the food fulfills the requirements fixed in the *Consultation Document on Generic Health Claims*². They do not have to obtain a prior product approval before displaying a health claim on the label

1. Source: Canada Gazette, Nutrition Labeling, Nutrition Claims and Health Claims. “Proposed Regulations Amending the Food and Drug Regulations”, June 2001.

2. Source: Health Canada. “Consultation Document on Generic Health Claims”, August 2000.

Canadian Regulatory Framework

- Specific claims¹:
 - The regulatory framework project on specific authorizations related to health claims for food was proposed by *Health Canada* in October 2001. This project informs us:
 - That it would be possible for a manufacturer to obtain approval from the *Food Directorate, Health Canada* for a specific product health claim
 - That an authorized claim would be identified by a *Claim Identification Number (CIN)* that would be displayed in product labeling. It is significant to mention that the CIN is not an equivalent in any way to the *Drug Identification Number (DIN)*
- The consultation document titled *Standards of Evidence for Evaluating Foods with Health Claims: A Proposed Framework* presents the related health claim requirements for certain foods²:
 - Product safety
 - Claim validity
 - Quality assurance

1. Source: Health Canada, Bureau of Nutritional Sciences. “Product-Specific Authorization of Health Claims for Foods – A Proposed Regulatory Framework”, October 2001.

2. Source: Health Canada, Bureau of Nutritional Sciences. “Consultation Document - Standards of Evidence for Evaluating 17 Foods with Health Claims: A Proposed Framework”, June 2000 (http://www.hc-sc.gc.ca/food-aliment/ns-sc/ne-en/health_claims-allegations_sante/pdf/e_Consultation_doc_en.pdf).



Canadian Regulatory Framework

Natural Health Products Regulations

- Regulations propose a new framework for the Natural Health Products (NHP) under the responsibility of the *Natural Health Products Directorate* (NHPD), newly created by Health Canada
- Regulation prescribes the standards to be respected by manufacturing, packing, labeling, storage, importation, distribution and sale of NHP. The manufacturers, distributors, importers, packers and labellers are aimed by this new regulation.
- “..., the NHPs are usually sold in capsule, pill, tablet or liquid form. As well, certain other forms, such as gum or bars, have come to be considered acceptable dosage forms.”¹
- In addition, “..., the definition is not intended to capture a product in a food medium which might otherwise fall within the definition if that food is primarily consumed to provide nourishment, nutrition or hydration, or to satisfy hunger, thirst or a desire for taste, texture or flavour.”¹

1. Source: Canada Gazette. “Impact Analysis on Natural Health Products Regulations”, December 2001 (<http://www.canada.gc.ca/gazette/part1/pdf/g1-13551.pdf>).

Canadian Regulatory Framework

- The information having to appear on the label of a NHP:
 - a) “its recommended use or purpose;
 - b) its recommended route of administration;
 - c) its recommended dose;
 - d) its recommended duration of use; and
 - e) its risk information, including any cautions, warnings, contra-indications or known adverse reactions associated with its use.”¹
- Every natural health product holding a licence of sale has an identification number, which must be indicated on the product’s label and preceded by the NHP designation
- A licence is issued upon Health Canada’s approval
- When the Health Canada licence request is registered, several details are necessary on medicinal and nonmedicinal ingredients contained in the product, conditions of use and the information supporting safety and effectiveness of the product¹

1. Source: Health Canada. “Natural Health Products Regulations”, (http://www.hc-sc.gc.ca/hpb/onhp/regs_cg1_e.pdf), January 2002.

Canadian Regulatory Framework

- The quality standards associated with functional foods and NHP are as follows:
 - Good Manufacturing Practices (GMP)
 - Good Clinical Practices (GCP)
 - Scientific documentation in support

- Time of transition:
 - “..., the transitional disposals provide that within two years of publication in the *Canada Gazette*, Part II, all NHPs must be properly licensed, must be packaged and labelled in accordance with the applicable requirements, must have been manufactured, packaged, labelled and stored at a site licence under good manufacturing practices, and must have their adverse reactions reported to Health Canada in accordance with the requirements.”¹
 - For DIN products, the current DIN provisions of the *Food and Drug Regulations* will continue to apply until the products receive a NHP licence¹

1. Source: Canada Gazette. “Impact Analysis on Natural Health Products Regulations” (<http://www.canada.gc.ca/gazette/part1/pdf/g1-13551.pdf>), December 2001.

Appendix A

Health claims:

- Calcium and Osteoporosis
- Sodium and Hypertension
- Dietary Fat and Cancer
- Dietary Saturated Fat and Cholesterol and Risk of Coronary Heart Disease
- Fiber-Containing Grain Products, Fruits, and Vegetables and Cancer
- Fruits, Vegetables and Grain Products that contain Fiber, particularly Soluble Fiber, and Risk of Coronary Heart Disease
- Fruits and Vegetables and Cancer
- Folate and Neural Tube Defects
- Dietary Sugar Alcohol and Dental Caries
- Soluble Fiber from Certain Foods and Risk of Coronary Heart Disease
- Soy Protein and Risk of Coronary Heart Disease
- Plant Sterol/stanol esters and Risk of Coronary Heart Disease



Appendix B

Specific claims would be limited in accordance with the following criteria¹:

- “Free” claims would be based on amounts of nutrients that are nutritionally insignificant or trivial in relation to current dietary recommendations
- Modifiers of the term “low” to denote the food contains an amount that is lower than low (e.g., “very low” or “ultra low”) would not be permitted
- The claim “(naming the %) fat-free” would be allowed accompanied by the statement “low fat”
- The criteria for claims concerning saturated fatty acids would include a restriction on the combined levels of saturated and trans fatty acids. Claims would be permitted for trans fatty acids and omega-6 and omega-3 polyunsaturated fatty acids
- The nutrient content claim “light” would be allowed only for foods that meet the criteria for either “reduced in fat” or “reduced in energy”
- An additional claim for energy “source of energy” has been included because this claim is currently defined in the Canadian Food Inspection Agency Guide to Food Labelling and Advertising
- The claims “calorie-reduced”, “low calorie”, “sugar-free” and “low sodium” would no longer be restricted to products meeting the definition of “foods for special dietary use”
- The terms “diet” or “dietetic” would be restricted to foods for special dietary use that could be labelled as “free”, “low”, “reduced” or “lower” in energy/calories or “sugar-free”
- The only nutrient content claims that would be permitted for foods for children under 2 years of age would be those respecting protein and the claims “no added salt” and “no added sugar”

1. Source: Canada Gazette, Nutrition Labelling, Nutrition Claims and Health Claims. “Impact Analysis on Regulations Amending the Food and Drug Regulations, June 2001.



Canadian Technological Roadmap on Functional Foods and Nutraceuticals

Section 3

Survey Results

September 2002



Purpose

- Increase our knowledge on functional foods and nutraceutical (FFN) companies
- Identify the technological needs necessary for the growth of existing and start-up companies
- Establish the convergence levels of the needs according to the different regions
- Identify the platforms to be set up to promote the development of the Canadian industry
- Contribute to the development of an action plan in order to support the growth of the industry
- Guide the government in their investment strategies



Methodology

- The definition of functional foods and nutraceuticals proposed by Health Canada was retained to identify the target lists
- In order to index the greatest number of companies in the FFN sector, several company lists from various sources were compared. Companies appearing on more than one list were retained
- The following lists were used as sources of information:
 - Functional Food and Nutraceutical Technologies in Canada (Agriculture and Agri-Food Canada's Web site list)
 - Contact Canada (database) www.contactcanada.com, (Search on Nutraceuticals, Cosmeceutical, Cosmetics, Herb Extracts, Vitamins and Supplements)
 - Saskatchewan Nutraceutical Network, Membership directory 2001/2002 Edition
 - List of Canadian businesses (appendix of the January 2001 KPMG study on functional foods and nutraceuticals)
 - Extracts from the Directory of Canadian Food Ingredient Exporters (Agriculture and Agri-Food Canada's Web site)

Methodology

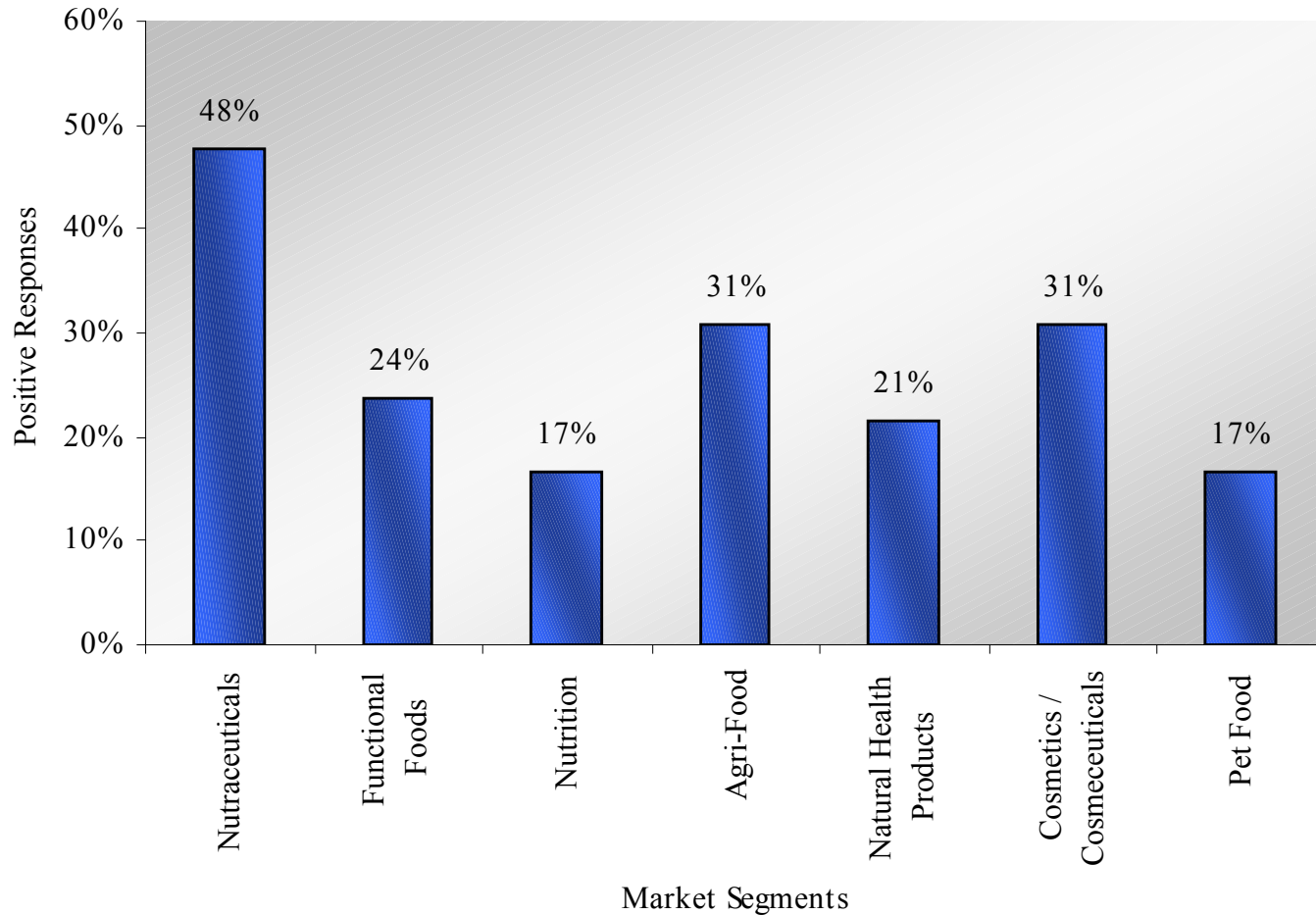
- Nearly 215 companies from the FFN sector as well as 25 companies from the agri-food sector received a questionnaire by email or fax
- A follow-up by email, fax and telephone was carried out at regular intervals
- 42 completed questionnaires were received and processed
- However, certain data could not be exploited because of incomplete answers



Canadian Industry

Company Profile

In which market sectors are companies most active?



Canadian Industry

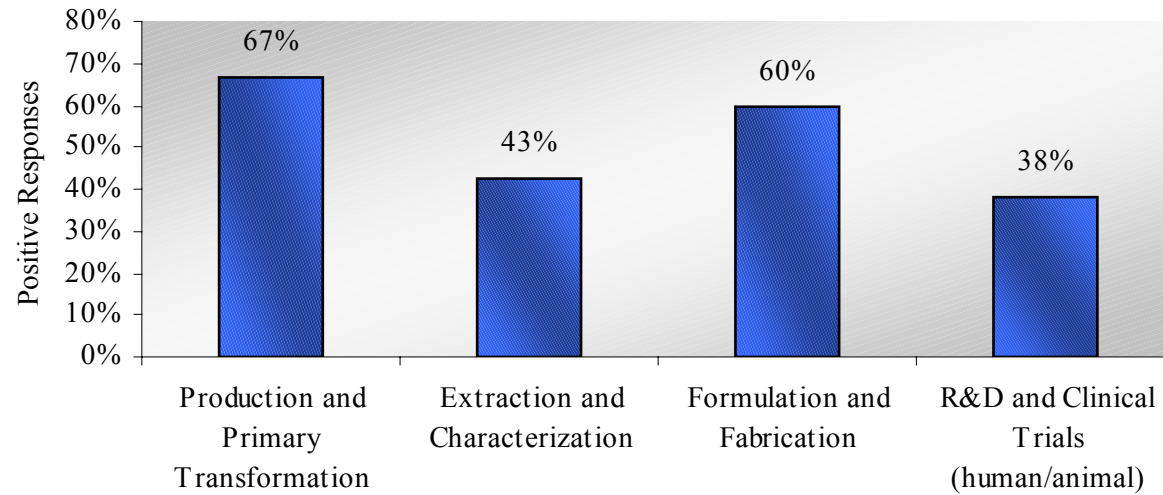
- Nearly 62% of companies are involved in more than one market segment
- An equal proportion of companies are at the start-up stage (- 5 years), growth (5-10 years) and expansion (+ 10 years)
- In addition, 31% of companies have annual sales lower than CA \$.5 million
- Close to 37% have less than 20 employees



Canadian Industry

Companies' Activities

What are the companies' activities?



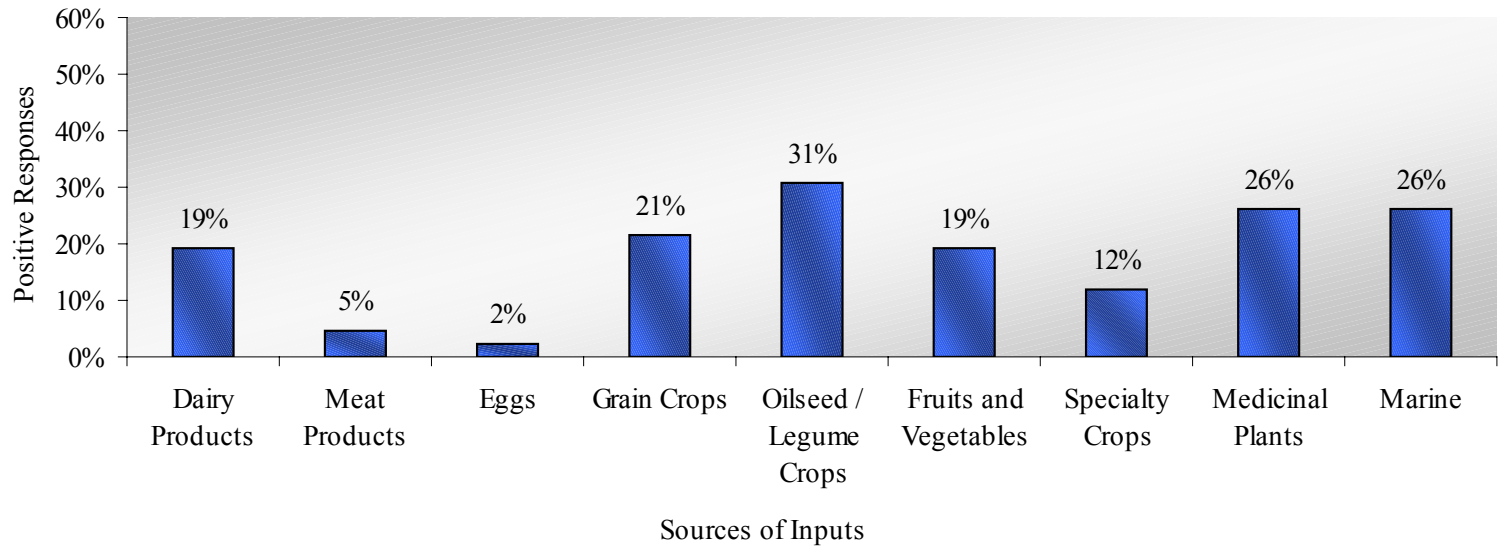
Canadian Industry

- Nearly 72% of companies work in more than one activity sector
- According to Canadian geography:
 - Manitoba and Saskatchewan as well as Ontario are more active in production and primary transformation
 - British Columbia and Alberta are more involved in extraction and characterization activities as well as formulation and manufacturing
 - Quebec is also implicated in primary transformation but mostly in formulation and manufacturing
 - The information available for the Maritime provinces does not permit to conclude any such trends



Canadian Industry

What input categories are mostly used by companies?



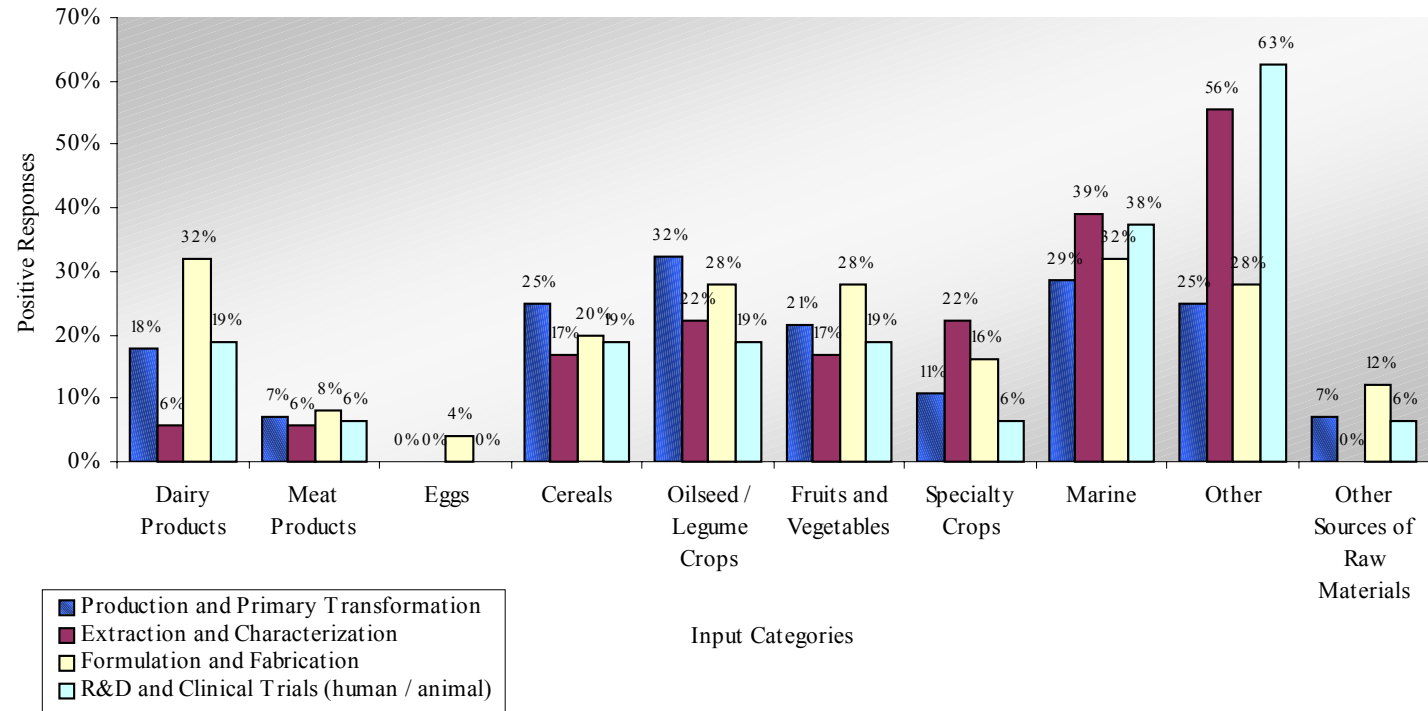
Canadian Industry

- In respect of Canadian geography:
 - The oilseeds/legume crops and medicinal plants are especially used in the Prairie provinces
 - Marine biomasses are mostly used in Quebec and in British Columbia
 - Milk products are mostly used by Quebec more than any other province
 - Ontario favours cereal and oilseeds/legume crops
 - The Maritime provinces show an interest in the marine biomasses but the available information does not demonstrate any trend



Canadian Industry

By production activity, which input sources are mostly used?



Canadian Industry

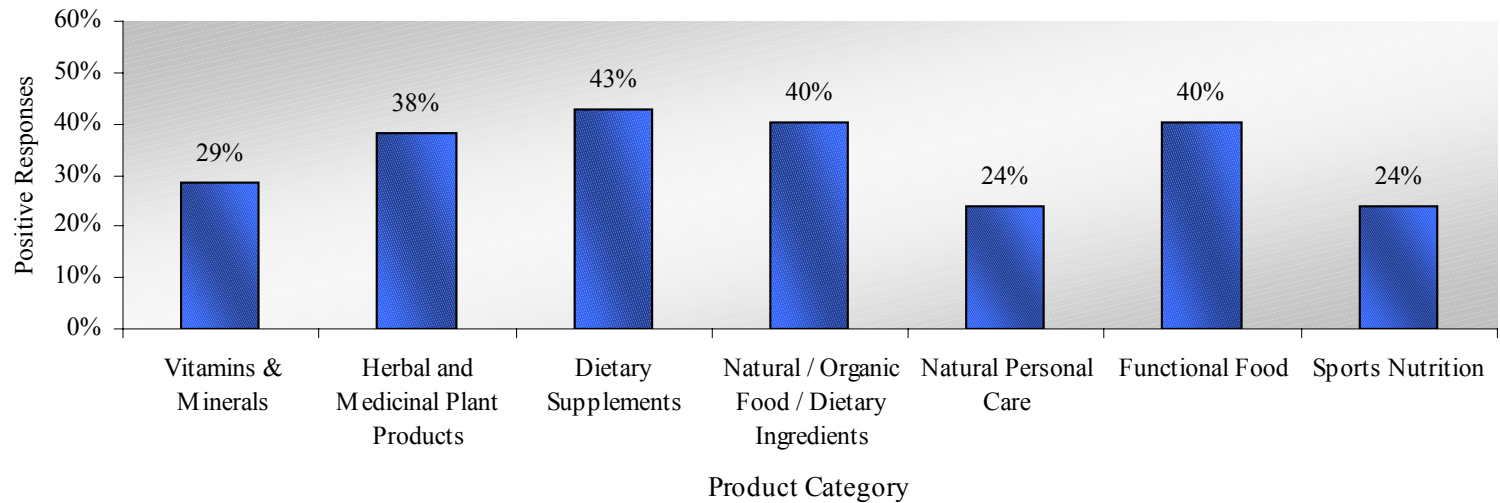
- 32% of active companies in production and primary transformation use oilseeds and legume crops as principal input
- 56% of active companies in extraction and characterization use marine biomasses as principal input
- 32% of active companies in formulation and manufacturing use dairy products and medicinal plants as principal input
- 63% of active companies in R&D and clinical trials use marine biomasses as principal input



Canadian Industry

Company Products

What are the product categories mostly manufactured by companies?



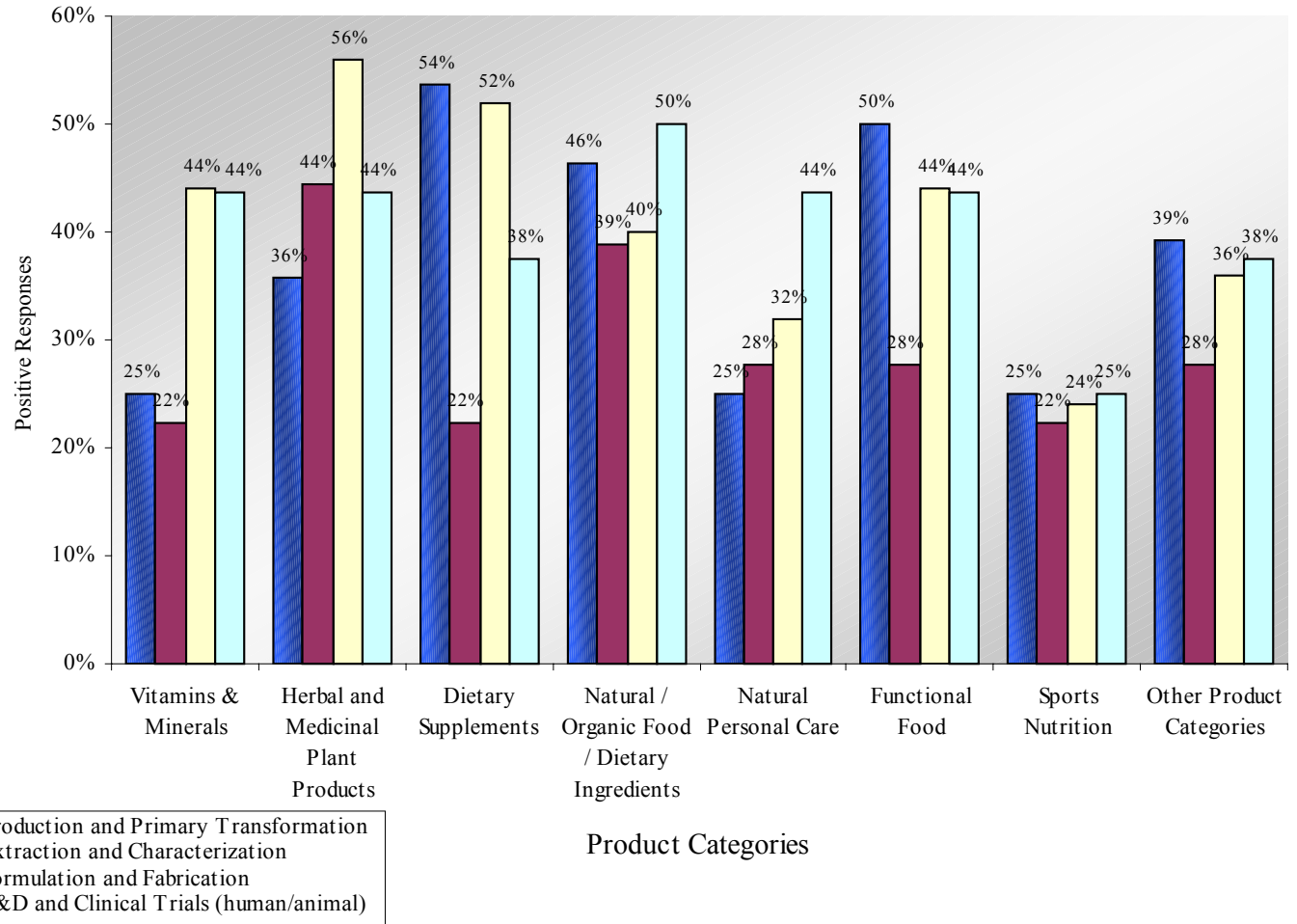
Canadian Industry

- More than 74% of companies manufacture more than one product
- British Columbia, Ontario and Quebec have shown a marked interest in the production of dietetic supplements, and of natural foods and functional foods. The Prairie provinces are mostly involved in the production of plant extract-based products and remedies. Nova Scotia is also interested by this last category as well as dietetic supplements and functional foods



Canadian Industry

What are, by activity, the products most frequently manufactured?



Canadian Industry

- 54% of companies active in production and primary transformation produce mainly dietetic supplements
- 44% of companies active in extraction and characterization and 56% active in formulation and manufacturing produce mainly plant extract-based remedies
- 50% of companies active in R&D and clinical trials produce mainly vitamins and minerals, plant extract-based remedies, personal care products and functional foods



Canadian Industry

Company Exportation

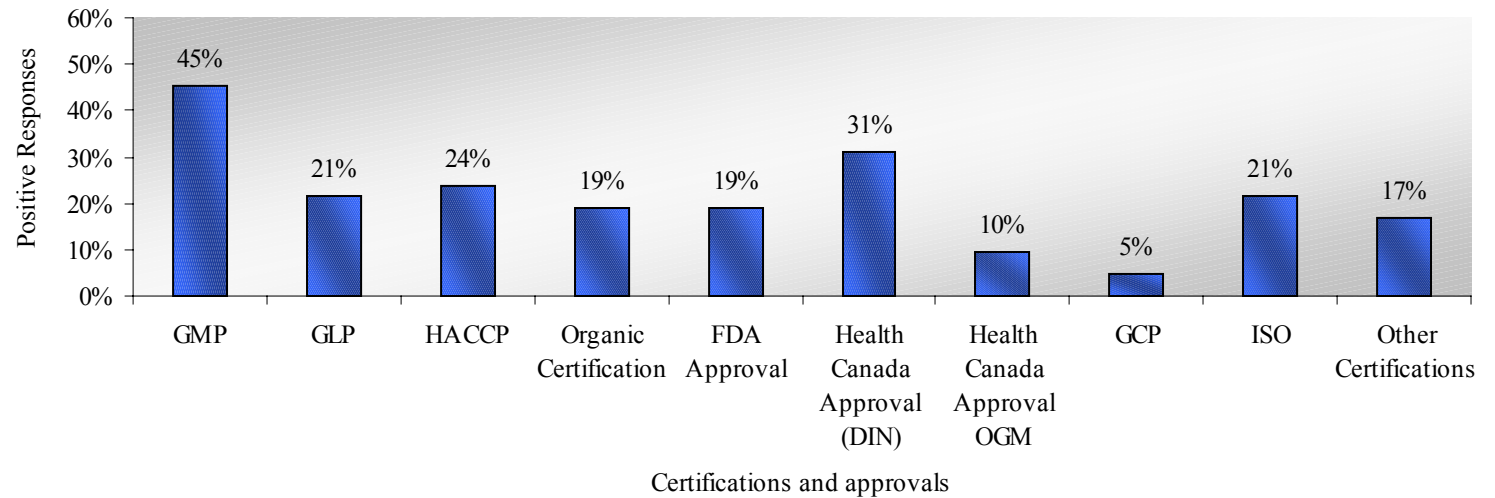
- 67% of companies are present on external markets
- 41% of them export their products in a proportion representing more than 75% of their total turnover
- 83% of companies that export have a turnover higher than CA \$.5 million
- 26% of companies have employees outside Canada



Canadian Industry

Company Certification

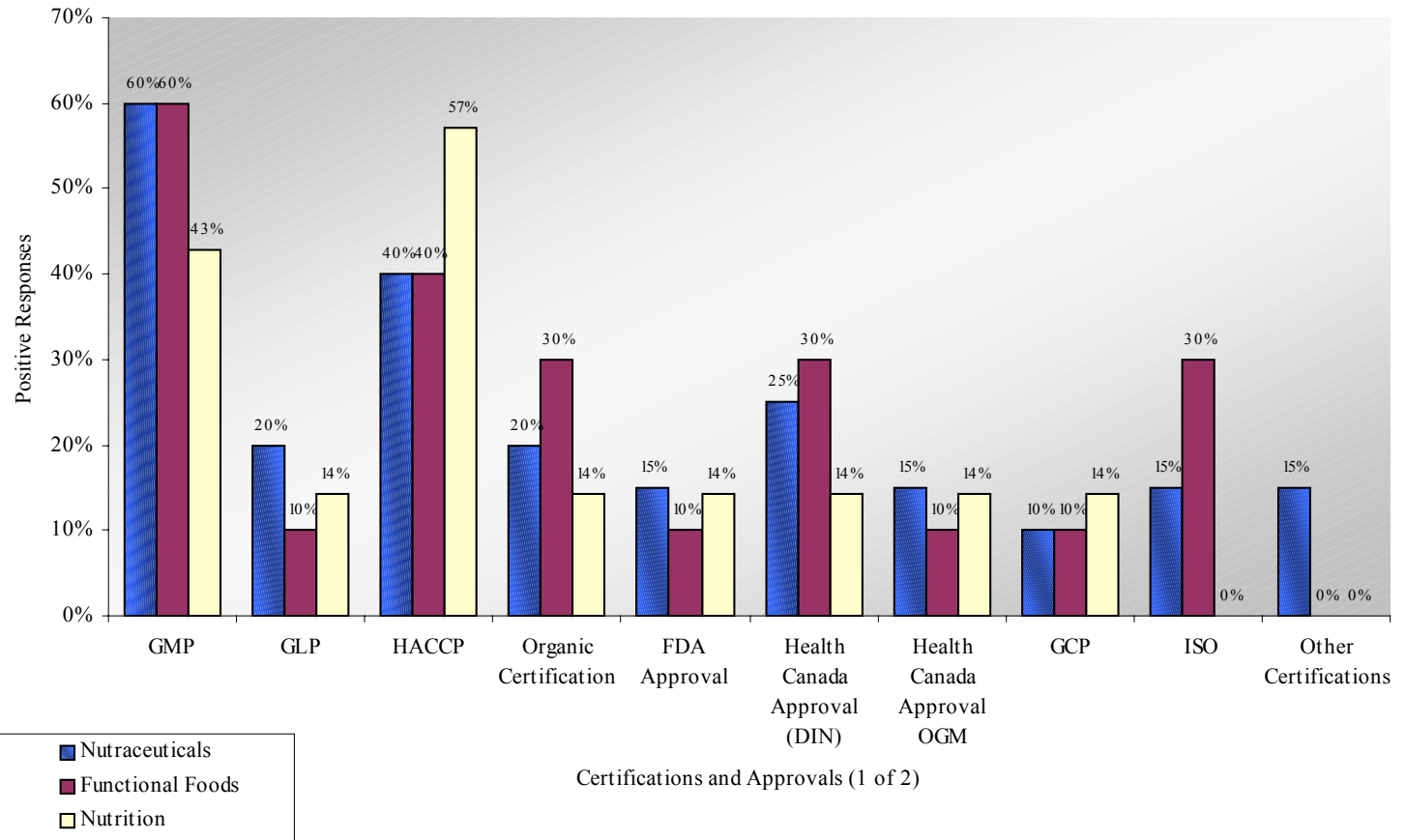
Which certifications do most companies hold?



- 64% of companies have more than one certification
- Good Manufacturing Practices (GMP) certification is most widespread through all production activities

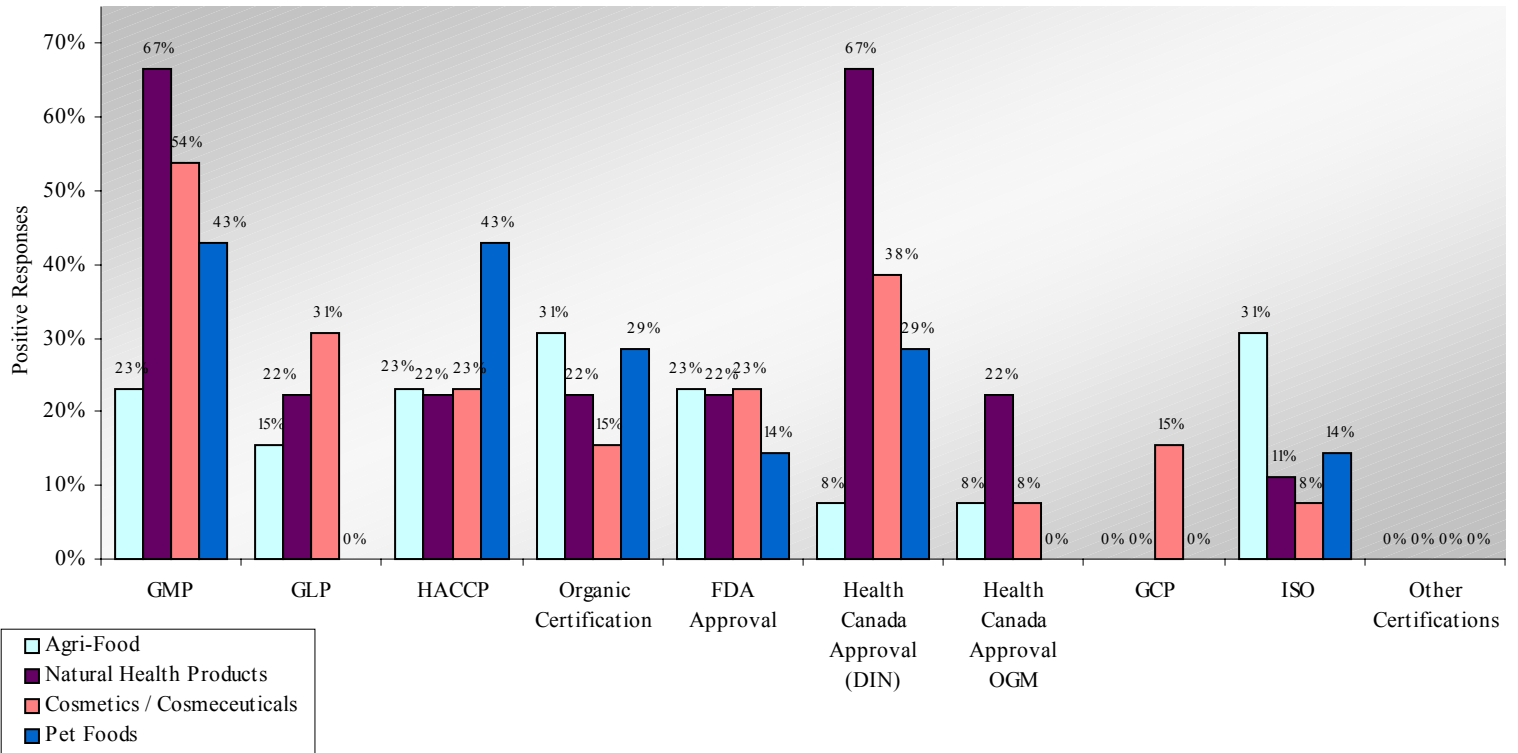
Canadian Industry

Which are, by market segment, the certifications most frequently held by companies?



Canadian Industry

Which are, by market segment, the certifications most frequently held by companies?



Certifications and Approvals (2 of 2)

Canadian Industry

- 67% of companies active in the natural health product sector are more frequently holders of GMP and DIN certifications
- 60% of companies active in the nutraceuticals sector as well as 60% in functional foods and 54% in cosmetics/cosmeceuticals are more frequently holders of a GMP certification
- 57% of companies active in the nutrition sector are more frequently holders of a Hazard Analysis and Critical Point (HACCP) certification



Canadian Industry

R&D Investment

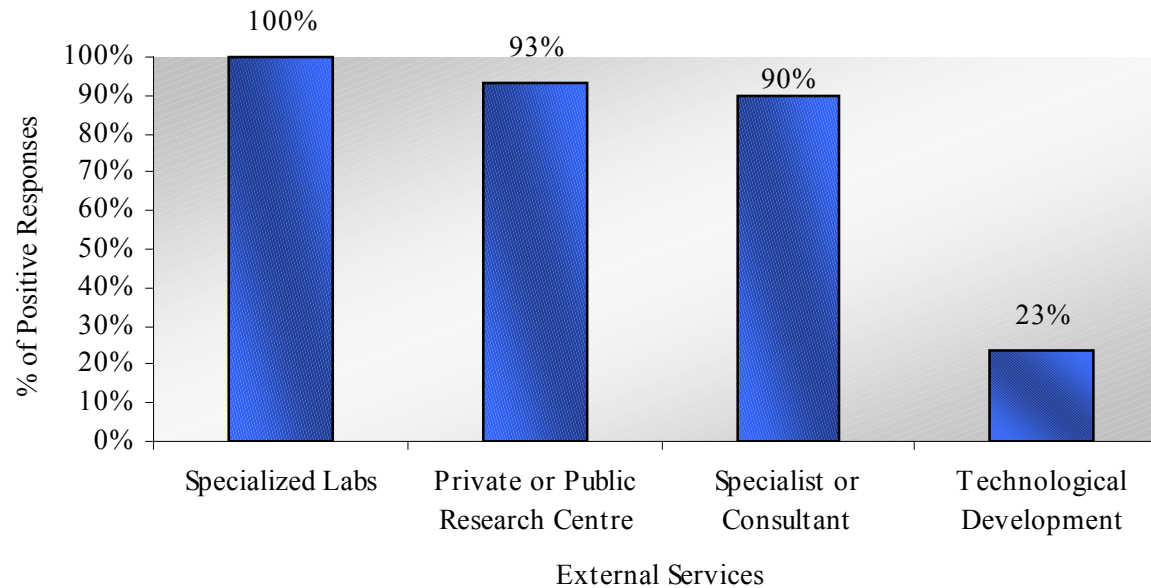
- Nearly 90% of companies employ personnel in R&D
- In proportion to their turnover:
 - 26% of companies having a turnover lower than CA \$1 million invest between 10-20% of their sales in R&D
 - Only 10% of companies having a turnover superior to CA \$1 million in R&D invest in the same proportion
 - 55% of companies having a turnover higher than CA \$1 million invest amounts inferior to 10% of their sales in R&D



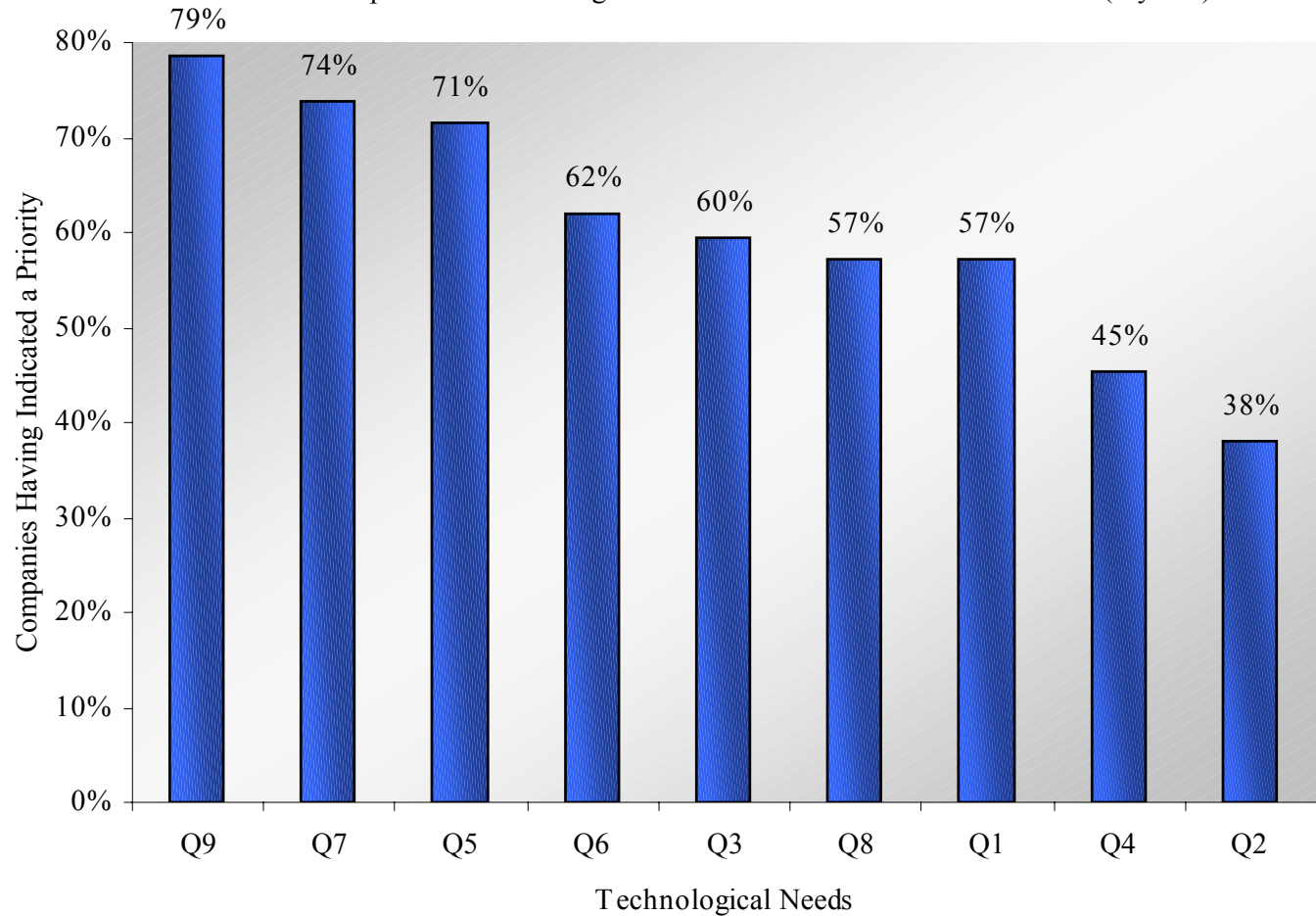
Canadian Industry

Use of Specialized External Services

- 86% of companies which carry out R&D work also utilize specialized external services
- 75% of companies not having activities in R&D utilize specialized external services
- No relation could be demonstrated between company turnover and the use of external services



Most Important Technological Needs Indicated for the Short Term (2 years)

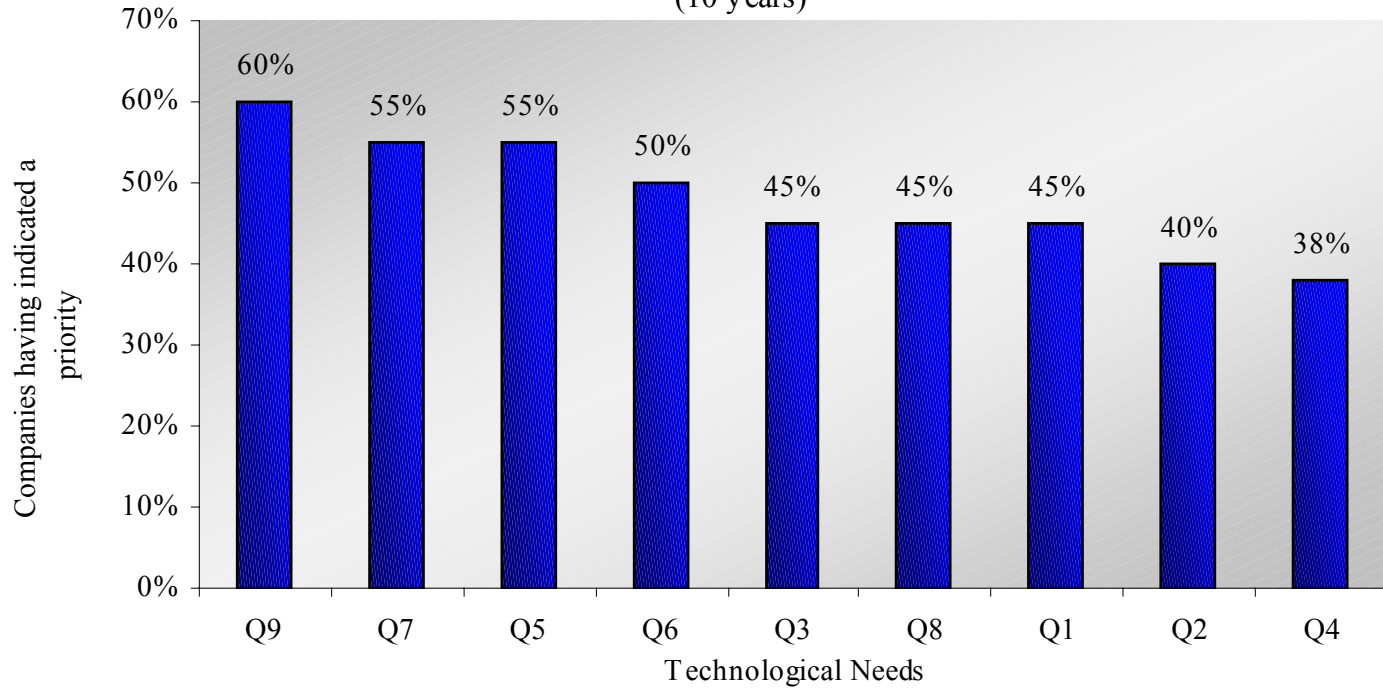


Legend:

- Q1: Production and primary transformation
- Q2: Genomics, genetics and proteomics transformation
- Q3: Extraction and purification
- Q4: Characterization
- Q5: Transformation, formulation and food production
- Q6: Bio-assays platforms
- Q7: Nutritional and toxicological studies
- Q8: Short series production for the marketing of functional foods and nutraceuticals
- Q9: Expertise with the establishment of various good practices



Most Important Technological Needs Indicated for the Long Term (10 years)



- Legend:
- Q1: Production and primary transformation
 - Q2: Genomics, genetics and proteomics transformation
 - Q3: Extraction and purification
 - Q4: Characterization
 - Q5: Transformation, formulation and food production
 - Q6: Bio-assay platforms
 - Q7: Nutritional and toxicological studies
 - Q8: Short series production for the marketing of functional foods and nutraceuticals
 - Q9: Expertise with the establishment of various good practices

Canadian Industry

Technological Needs

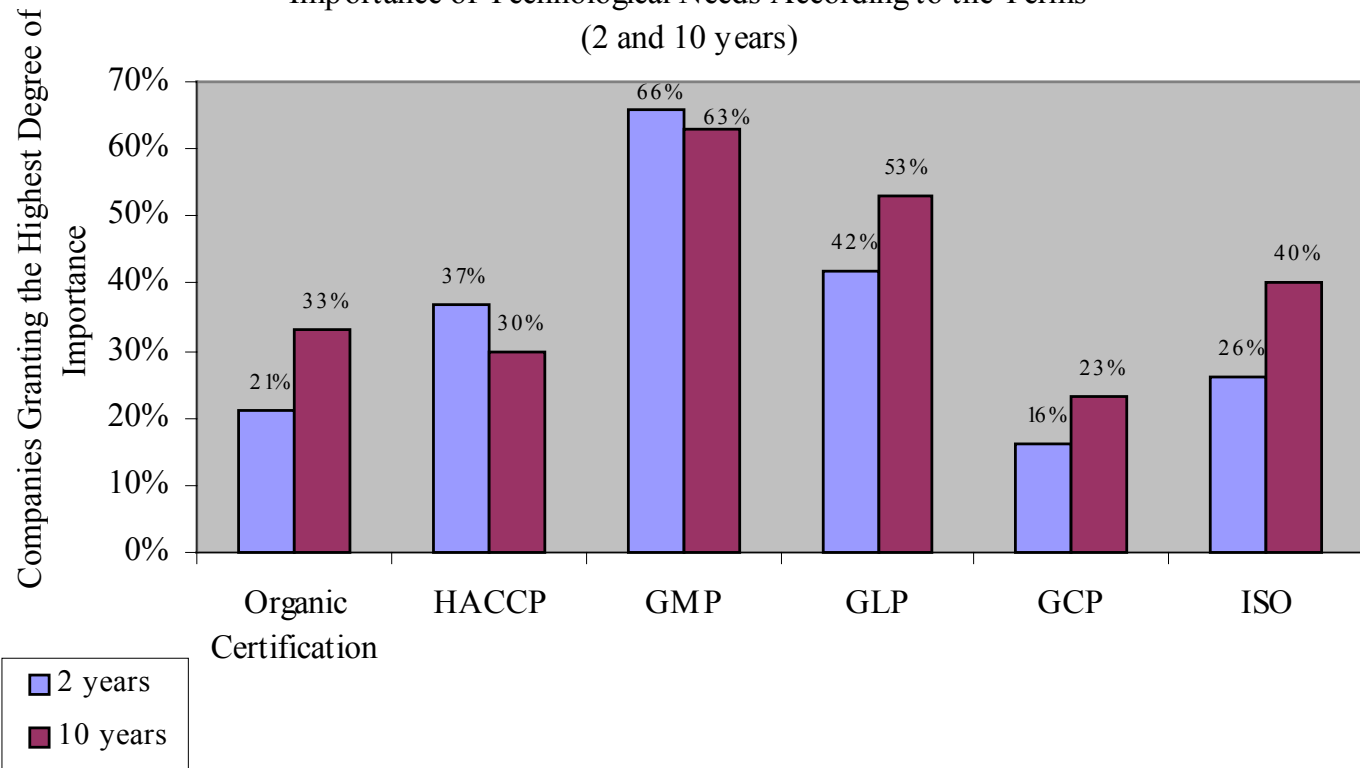
- Technological needs remain about the same for the 2 and 10 year terms
- However, for the 10 years, the companies did attach importance by showing a variation of specific technologies although the needs remain the same
- These results are explained in the following way:
 - The companies do not perceive market trends, which would justify a change of priority on technological needs in the long run
 - The companies identified the needs for the industry rather than their own needs



Canadian Industry

Category (Q9): Expertise with the establishment of various good practices

Importance of Technological Needs According to the Terms
(2 and 10 years)



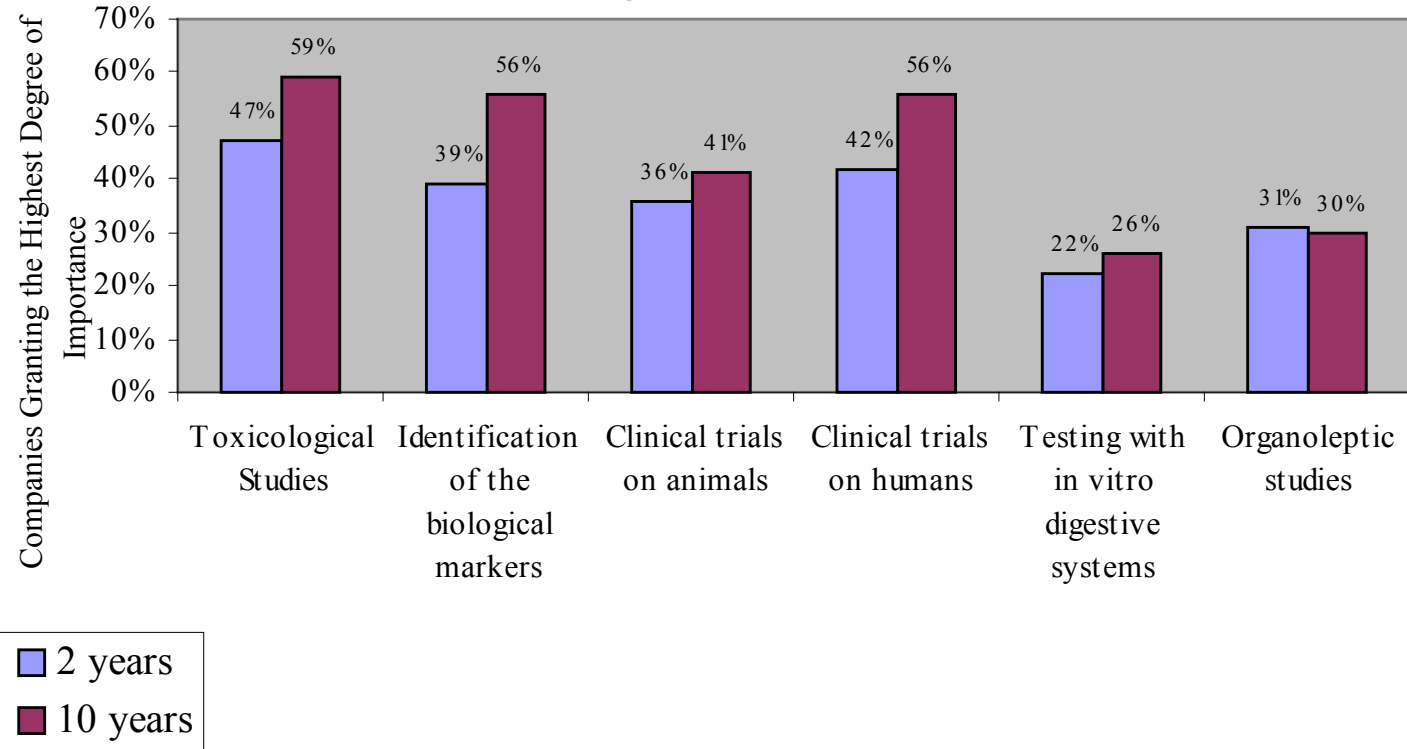
Canadian Industry

- 79% of the companies affirm having priority technological needs in the short-term with regard to the expertise in the establishment of various good practices
- 60% of the companies are concerned by the same long-term needs
- Within this category, company priorities are maintained in the short and long-terms in what relates to both GMP and GLP



Canadian Industry

Category (Q7): Nutritional needs from nutraceutical and toxicological studies



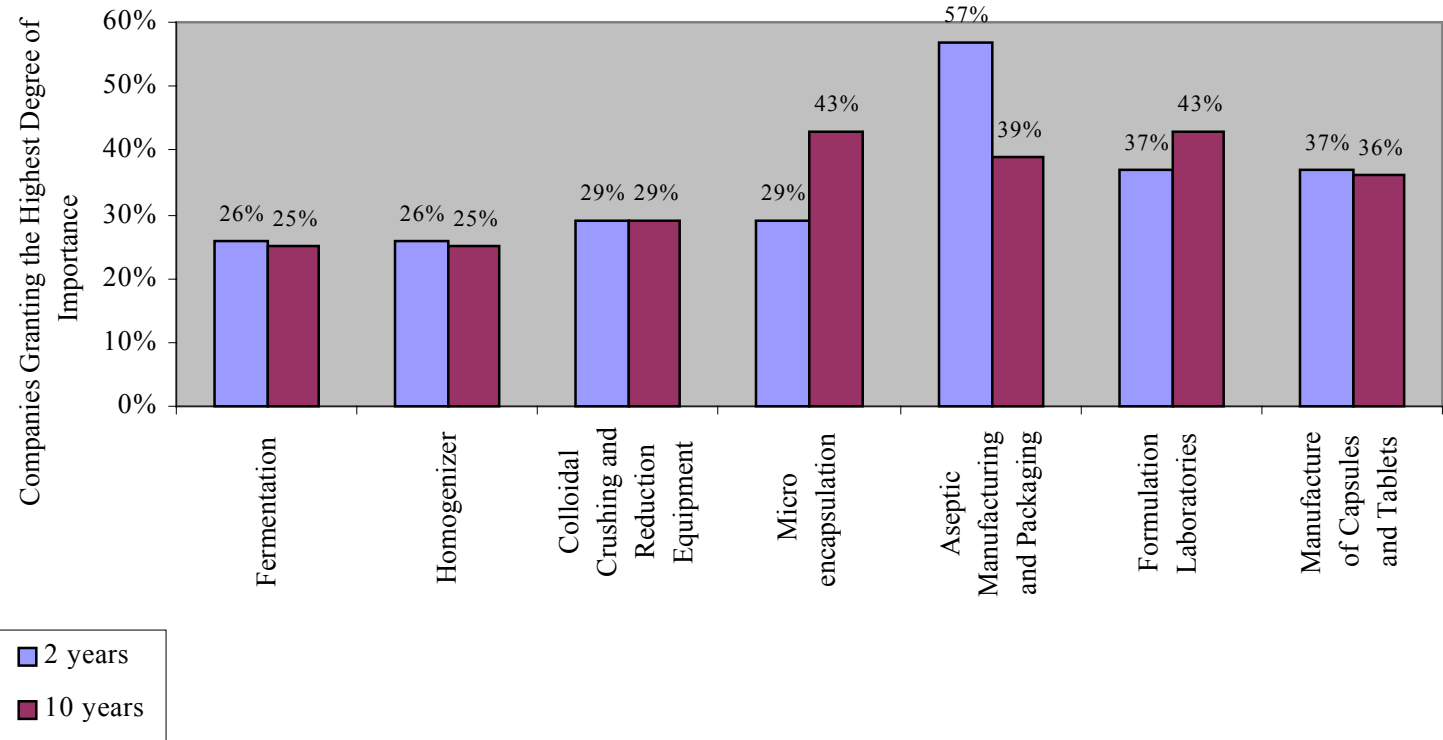
Canadian Industry

- 74% of companies affirm having priority technological needs in the short-term with regard to the nutritional and toxicological studies
- 55% of companies have the same long-term needs
- Within this category, the needs for toxicological studies, clinical trials with humans and the identification of biological markers will tend to increase significantly in the next 10 years



Canadian Industry

Category (Q5): Transformation, formulation and food production



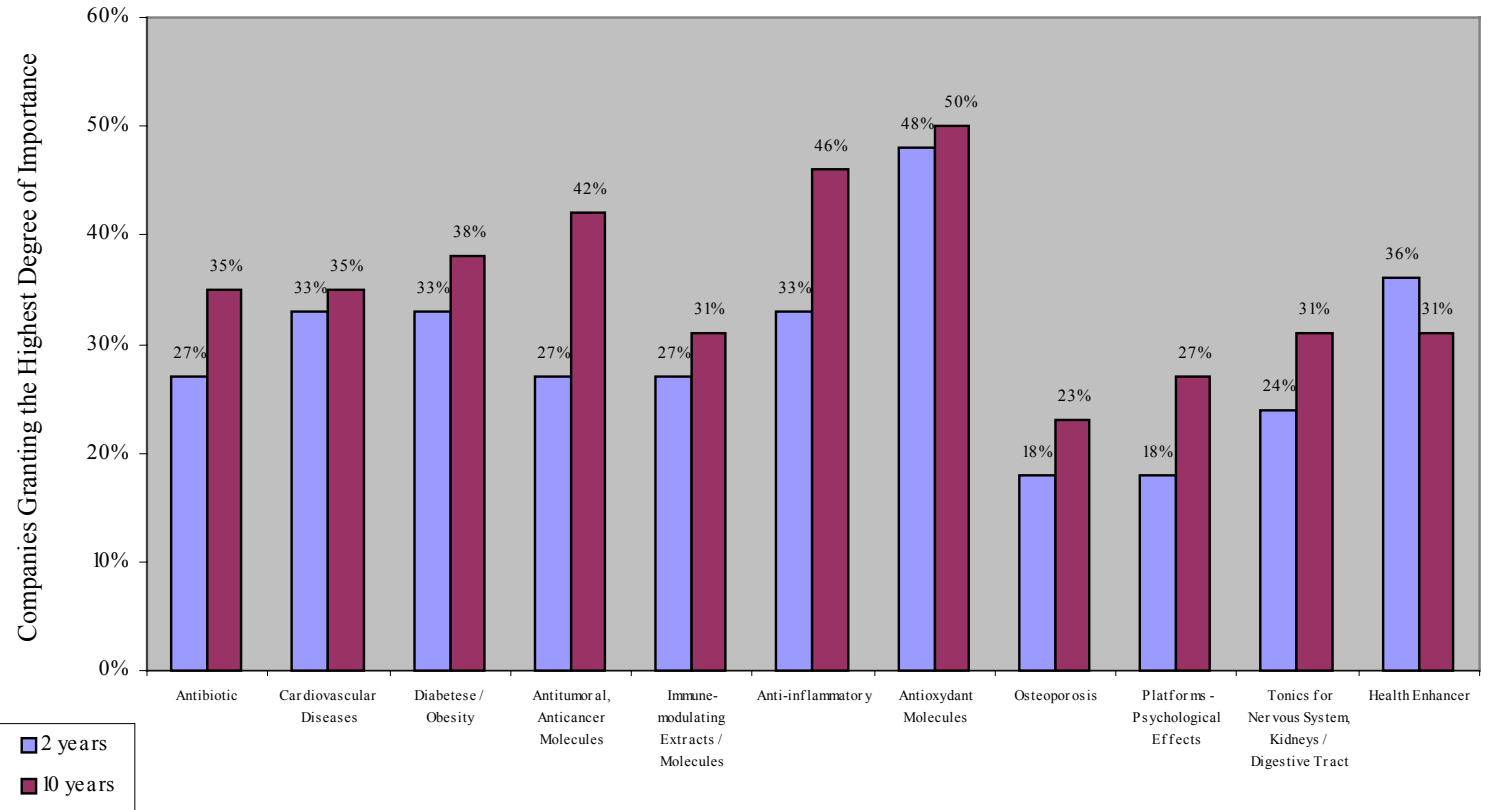
Canadian Industry

- 71% of companies affirm having priority technological needs in the short-term with regard to transformation, formulation and food production
- 55% of companies have the same long-term needs
- Within this category, today's significant need for technologies in aseptic manufacturing and packaging should decrease during the next years
- In addition, the need for micro encapsulation should grow significantly in the next 10 years



Canadian Industry

Category (Q6): Bio-assay platforms



Canadian Industry

- 62% of companies affirm having priority technological needs in the short-term with regard to bio-assay platforms
- 50% of companies have the same long-term needs
- Within this category, the priority need in the short-term is a platform allowing the identification of antioxydant molecules, which will remain a long-term priority
- A significant increase in the needs for platforms allowing the identification of antitumor, anti-cancer molecules and anti-inflammatory is envisaged in the long run
- Cardiovascular diseases, diabetes and obesity will remain significant concerns in the long run



Canadian Industry

Other categories:

- Among extraction and purification technologies, today's significant technology in the extraction by membrane will likely increase in the next 10 years
- The food conservation technologies for the short series production remain a significant concern for companies in the next years. However, the needs for the manufacturing processes of bars will also be more significant in the long run
- In the primary transformation and production categories, needs were identified without showing a tendency for the short and long terms
- Among the technologies associated with characterization, chromatography is the largest priority identified for both the short and long terms
- The safety of GMO is a principal concern for companies, both in the short and long-terms, for genomics, genetic transformation and proteomics categories. However, the needs in functional and nutritional genomics, and proteomics will increase significantly in the next 10 years



Canadian Industry

Future development opportunities:

- Implementation of regulation and rules governing the labeling of GMO
- Regulation supported by a scientific basis would be desirable
- Regulation affairs and protection of the patents
- Importance in obtaining high quality products, of good taste and certified
- Moreover, it was mentioned on several occasions that GMO represent a threat for the nutritional products derived from natural sources
- New technologies are necessary to better perform and to interest investors



Canadian Industry

- Several companies have shown an interest in the development of technologies on the following topics:
 - Antioxidants, anti-inflammatory, immunosuppressor and immunostimulant
 - Extraction and purification (in particular, oils)
 - Genomics, proteomics
 - Development of sequencing tools and peptide synthesis economically viable on an industrial scale
 - Micro encapsulation
 - Cold pasteurization
 - Conservation
 - Fractioning
 - Clinical testing



Canadian Industry

Factors of interest for the use of an external service/infrastructure:

- Among the companies using external specialized services, 92% show an interest to continue in this direction. There are no factors, such as turnover, size or stages of company growth which influence a company's interest in using a new service/infrastructure, which would be proposed to them
- The reasons for which the companies would use a new service/infrastructure: by order of importance
 - Know-how
 - Cost of the service/infrastructure
 - Access to new technologies/equipment/technical support
 - Non-existent internal expertise
 - Credibility of service/infrastructure
- The expertise/service/infrastructure held within the company and the lack of financial resources would be the principal reasons for not using a new service/infrastructure



Canadian Industry

- A company's principal expectations as for the use of service/ infrastructure are as follows:
 - Facilitate product development
 - Facilitate product accreditation
 - Facilitate marketing
- Principal reasons that would not encourage companies to use service/ infrastructure
 - Exclusiveness of intellectual property held by external entity
 - Inadequate management of confidentiality related to work
 - High service costs
- Principal desired mode of payment is the fixed fee



Canadian Technological Roadmap on Functional Foods and Nutraceuticals

Section 4

Focus Group Results

September 2002



Canadian technological roadmap on Functional Foods and Nutraceuticals

Focus Group Results

Addressed to KPMG

May 2002

Submitted by:

HODGINS & Company Management Consultants Inc.

236 – 111 Research Drive

Saskatoon, Saskatchewan

CANADA S7N 3R2

Phone: (306)934-1742 Fax: (306)934-1641

E-mail: mhodgins@innovationplace.com

TABLE OF CONTENTS

	<i>Page</i>
1. Introduction	1
2. Observations and Conclusions	1
3. Focus Group Results – Toronto	3
3.1 Current State of the Industry	3
3.2 The Vision of the Industry in 2010	5
3.3 Future Technology Needs of the Industry	6
3.4 Meeting Future Technological Needs of the Industry	6
3.5 The Way Forward	7
4. Focus Group Results – Saskatoon	7
4.1 Current State of the Industry	7
4.2 The Vision of the Industry in 2010	9
4.3 Future Technology Needs of the Industry	9
4.4 Meeting Future Technological Needs of the Industry	10
4.5 The Way Forward	11
5. Focus Group Results – Vancouver	12
5.1 Current State of the Industry	12
5.2 The Vision of the Industry in 2010	13
5.3 Future Technology Needs of the Industry	14
5.4 Meeting Future Technological Needs of the Industry	15
5.5 The Way Forward	17

APPENDIX A – Participant List

1. INTRODUCTION

KPMG LLP was contracted to undertake a study that would result in the development of a Canadian technology roadmap for the functional foods and nutraceuticals (FFN) industry in Canada.

The purpose of the study was to understand the technological needs of the industry in the next ten to twenty years. Secondly a strategy would be developed that would ensure the technology is in place to assist the industry gain a competitive advantage in the global marketplace.

The first step of the project was an industry wide survey of all players in Canada. Once the data was gathered and analysed from the survey, the second step was to hold regional focus groups to review the information and explore further some of the issues raised in the survey.

This report outlines the results of the focus groups held in:

- Toronto, Ontario – May 2, 2002 – Sheraton Hotel at Pearson International Airport;
- Saskatoon, Saskatchewan – May 8, 2002 – PBI/National Research Council at the University of Saskatchewan; and
- Vancouver, British Columbia – May 10, 2002 – National Research Council at the University of British Columbia.

Participants at each focus group included representatives from industry, industry associations, universities, the investment community, government departments and research agencies. The participant list is provided in Appendix A.

The results of each focus group are presented separately as requested by the industry.

2. OBSERVATIONS AND CONCLUSIONS

The three focus group discussions were somewhat different due to the size of the groups and the nature of the participants (background, experience and challenges faced). While the focus groups in Toronto and Saskatoon focused on the functional food segment of the industry, the British Columbia discussion centred on nutraceuticals due to the nature of the industry in that region.

In addition, while the theme of the focus groups was technology, participants, particularly those from private industry, wished to discuss business related issues rather than technological issues. In fact the major concern of the industry is funding for small business and ensuring a public policy exists that is supportive of business through tax and research incentives.

The conclusion reached is that most SMEs depend on the service/research agencies (e.g. universities, AAFC, NRC, PBI, etc.) to solve the technological issues. The companies themselves know the end product desired but in general do not have the in-house expertise nor the funds to hire the in-house expertise to address the technology. Therefore, companies (SMEs) rely heavily on the service/research agencies to identify the necessary technology and then make it accessible to the industry.

The service/research agencies are then challenged to anticipate the future technology needs of the industry.

The participants believe the future industry will focus on the functional food sector and will be comprised of large companies and small innovative or specialized ingredient companies. Clearly, all focus groups concluded that the future of the industry will depend on a partnership with the health sector (working with various Departments of Health or specific research institutes such as the Cancer Centre) to develop preventative food products targeted at specific diseases.

Many technologies were identified as important to the growth of the industry. The Toronto group gave priority to the following three technologies:

1. Applications for building a safe food system;
2. Highly sophisticated techniques that are speedy and accessible that will standardize measurements for food safety and efficacy (platforms must be developed); and
3. Bioactive characterization.

The Saskatoon group recognized the importance of the above technologies but noted that the industry is not comprised of a uniform set of products and therefore identifying a specific, prioritised set of technologies is difficult.

And the Vancouver group, when pressed to select priority areas of technology that must be addressed, concluded that there are no new technologies that must be developed. This issue is rather to look at new applications of current technologies.

All groups suggested that when developing a pathway to developing the necessary technologies, that various models be considered such as:

- Genomics Canada;
- Value chains that include participation of NSERC, IRAP, AAFC, universities, foreign companies, the financial community, etc.;
- The B.C. wine industry;
- Technology development in Raleigh, Massachusetts; and
- The USDA model that joins the medical faculties of Boston University and the Universities of Chicago and Illinois.

3. FOCUS GROUP RESULTS - Toronto

The following section summarizes the information from the focus group of 13 participants at the Toronto focus group held on May 2, 2002.

3.1 Current State of the Industry

The group was first asked to describe the Canadian industry. The discussion immediately focused on “a non functional functional food industry” that is currently hindered by government policies. Some participants expressed the view that, as a result of the policies, there has been an inability to attract business to Canada. In addition, frustrated Canadian businesses have moved to other countries where tax laws are more favourable to business.

Due to the passionate discussion on this topic, the group was asked at this point to identify what the government might do to alleviate this problem. The suggestions made were:

- To provide tax incentives (both personal and business);
- To provide research incentives;
- To immediately establish a regulatory environment for the industry;
- To address the disconnect between health and the industry by:
 - Establishing cross-disciplinary teams in the government to deal with industry issues (e.g. representatives from Economic Development, Health Canada, Agriculture and Agri-Food Canada, Regulatory Affairs, Science and Technology, etc.)
 - Developing a public policy that embraces functional foods;
 - Developing a public policy that addresses health issues through prevention rather than reaction (must secure the concept of “wellness” into the government agenda);
- To craft a cultural change that makes functional foods “cool”;
- To find “selling points” to support the model; and
- To facilitate ways that will assist the industry in working together.

The focus group discussion then returned to **describing the current industry**. Other descriptors included:

- All major food companies have established a nutraceutical department.
- The Canadian industry is focused on manufacturing.
- There are two different channels in the industry – natural health products and functional foods (functional food ingredients and nutraceuticals).
- The global industry is moving towards functional foods.
- The future of the industry is in functional foods (currently lacks definition).
- The large global players are setting the trends.
- The Canadian industry produces finished goods for the export market.
- The industry is comprised of both SMEs and large companies.

The **challenges faced by the industry** were identified as:

- Inability to do business due to lack of regulations, infrastructure, government barriers (e.g. tax laws) and investment (difficulty in launching products because of current environment);
- Perception of Canadian products (not always the best);
- Continual drive to export products rather than build a home market;
- Strong pharmaceutical companies taking market share of SMEs;
- The difficulty in “engaging” the industry to work together to revamp it;
- The current focus on creating economic development in the country;
- Industry/government mindset (rural development goal of the government);
- Economic versus political agendas of the policy makers;
- Differing needs of SMEs and large companies; and
- The ability to push functional food products to the market quickly in order to gain a competitive advantage.

The group was then asked to identify **the technology needs of the industry**. While it was pointed out that the following needs pertain to both SMEs and large companies, the magnitude of specific needs may be different. The needs were identified as:

- To establish regulatory claims;
- To attract investment;
- To establish research incentives;
- To establish tax incentives;
- To develop technologies;
- To form alliances in the industry;
- To provide marketing assistance;
- To educate consumers on the benefits of functional foods and nutraceuticals;
- To train scientists and technicians for the private industry;
- To conduct research into:
 - Bioactives;
 - Safety;
 - Efficacy;
 - Scale-up capabilities;
 - New product development; and
 - Claims.

The group was then asked to **prioritise the top three technology needs** for both large and small companies. A fourth need was added to the list as the group believed that the top four needs were all priority areas.

The following table provides an overview of their choice in order of priority.

Top Needs of the Industry

SMEs	Large Companies
1. Ability to make regulatory claims	1. Ability to make regulatory claims
2. Development of new technologies	2. Business tax incentives
3. Business tax incentives	3. Research incentives
4. Research incentives	4. Development of new technologies

3.2 The Vision of the Industry in 2010

The participants were then asked to look into the future and describe the industry in 2010. Their responses are outlined in the following table.

The Vision of the Industry in 2010

Function	Description
Industry	<ul style="list-style-type: none"> • Industry segments use alternative methods of delivery (e.g. topical, injections) to assimilate bioactives. • Industry is comprised of large companies and dynamic SMEs. • Canada is a service industry for large, global companies. • The food companies have power in the industry. • Companies have the ability to act with speed to bring products to the market. • Canada is recognized as innovators in producing the healthiest food products. • Incentive packages are offered that attract business to Canada.
Products	<ul style="list-style-type: none"> • Foods are full of functionality (good tasting & convenient). • Ingredients are produced in Canada through extraction methods. • Foods have health claims customized for individuals. • Food items are a delivery method for medicines. • There is a global recognition of isolation/characterization of bioactives.
Regulations	<ul style="list-style-type: none"> • Functional foods have a FIN number. • There are product specific certifications (GMP, GLP, HACCP, ISO, identity preservation). • Regulatory agencies have highly skilled personnel. • Regulatory agencies are able to enforce regulations.
Market/Consumers	<ul style="list-style-type: none"> • Consumers shop for foods that address personal health problems. • Consumers pay for genetic screening. • Functional foods are intermingled on the shelf with conventional foods.
Research	<ul style="list-style-type: none"> • Canada’s innovative scientific community is the envy of the global industry. • Health care costs are reduced by 50%. • Research is fee-for-service. • “Unique” research is conducted in Canada.
Competition	<ul style="list-style-type: none"> • Competition comes from India and China.
Education	<ul style="list-style-type: none"> • Universities with agriculture colleges have courses in functional foods.

3.3 Future Technology Needs of the Industry

If the industry is to reach that vision, the participants discussed the technological needs that will be required by the industry which are:

- In vitro bioefficacy testing that is cheaper and faster (as a result of consumers demanding in vitro testing);
- Controlled environment systems;
- Better extraction processes;
- Field monitoring processes;
- Highly sophisticated techniques that are speedy and accessible that will standardize measurements for food safety and efficacy (platforms must be developed);
- Techniques that will prove “quality” of products;
- Methods to determine affects of crop propagation and application on crop sites; and
- Techniques that will assess the differences in products.

In priority, **the three most critical technologies for development** are:

1. Applications for building a safe food system;
2. Highly sophisticated techniques that are speedy and accessible that will standardize measurements food safety and efficacy (platforms must be developed); and
3. Bioactive characterization.

3.4 Meeting Future Technological Needs of the Industry

The participants were asked to consider what it would take to get the industry to meet the technological needs. Their responses included:

- The need to establish a certification process for efficacy (speed is critical);
- Need skilled and educated scientists with multi-disciplines;
- Need for skilled lawyers in patent law;
- Trained health care workers who understand the value and use of functional foods;
- Fermentation technology (platform technology issue);
- Development of robotics for farm use and processing
- Need work in bioinformatics (need for better algorithms to follow affects of food and what happens in the body);
- Need for work in metabolomics;
- Need to identify applications in certain areas;
- Need to build a “safe system” that provides value but no fear;
- Need for research into genome interpretation;
- Must bring Canadian industry and research networks together.

The participants noted that much of the technology is already developed but understanding the various applications of the technology is critical.

3.5 The Way Forward

The participants suggested that the following considerations be given in developing a strategy for meeting the technological needs:

- Examine various models (e.g. technology development in Raleigh, Massachusetts);
- Conduct a global scan to ensure that technology is driven by market needs;
- Identify who is accountable for the vision of the FFN industry in Canada;
- Gather a multidisciplinary team together comprised of senior people (“science deputies) from NRC, AAFC, Finance, Economic Development, Health Canada etc. to:
 - Develop a common vision based on market demands;
 - Conduct “inside” lobbying in the various departments (bureaucratic intervention).
- Build a business plan to take to “investors”.

The government will then be responsible for policy intervention and the provision of incentives to the industry. In addition, government will be required to provide funds to the various universities to develop expertise that will service and/or work in industry. The industry must be responsible for lobbying the government for the policies and funds.

4. FOCUS GROUP RESULTS – Saskatoon

The following section summarizes the information derived from the focus group of 24 participants at the Saskatoon focus group held on May 8, 2002.

4.1 Current State of the Industry

The participants were first asked to describe a picture of the current industry in Canada. Their responses were:

- It is small and comprised of small companies.
- The industry is both emerging and fragmented.
- Companies, research institutes and funders are yet to form partnerships.
- There are some partnerships with multinationals (e.g. Emerald Seeds and Royal Shoutten).
- Products are sold into the consumer goods market (more hype than science).
- There is some question as to the legitimacy of many products.
- There is a lack of understanding between the scientific community and herbalists.
- Players in the industry do not communicate with each other.

- There is not a level playing field (claims are made that are not backed in science which leads to questionable ethics).
- The regulatory uncertainty has not helped the local success of companies.
- A dichotomy exists between intellectual property, lack of investment and rigid FDA requirements.
- Ingredient suppliers dominate the industry.
- The Canadian industry is comprised of “late bloomers” (other countries have been in the industry longer which leaves Canada at a competitive disadvantage).
- There is a huge disconnect between processors and producers.
- There is excellent science capability.
- A history of networking exists in the province that can be applied to this industry (e.g. AAFC, Health Canada and Industry Canada are working together).
- Canada has a reputation of quality products and a pristine environment.
- There are resources directed to regulations.
- The industry has skilled producers.
- The industry has a great asset in the Saskatchewan Nutraceutical Network.

The group was then asked to identify **current technology needs** faced by the industry. Their responses were:

- Lack of funding for 2nd and 3rd stages of development (early stage funding is currently available);
- Need to reduce the length of time to develop technology;
- HPLC;
- Need for expertise;
- Need for professionals that have both science and business backgrounds;
- Patent restrictions;
- Commercialisation issues such as time, money and know-how;
- Difficulties in doing proof of concept:
 - Wrong research being conducted;
 - Lack of strong IP;
 - Lack of legal expertise in this area.
- Need to examine activity of properties (cause and effect of properties) in order to make legitimate claims;
- Lack of understanding or fear on the part of companies to undertake “the science” – need for GRAS status;
- Need for “mechanisms”;
- Not enough basic research being undertaken;
- FTO; and
- Need for efficacy testing and quality control (labelling issue).

The need for stronger IP was noted as the priority area.

4.2 The Vision of the Industry in 2010

The participants were then asked to look into the future and describe the industry in 2010. Their responses are outlined in the following table.

The Vision of the Industry in 2010

Function	Description
Industry	<ul style="list-style-type: none"> • The industry is mature and more regulated. • The industry is driven by large corporations wanting science based products. • The medical community is accepting of the FFN industry. • A small number of players have a larger market share. • Industry is comprised of large ingredient players, larger companies and mid-sized specialty companies. • Some alliances among the players have formed. • Companies have integrated science and business. • There are more bioproduct companies.
Products	<ul style="list-style-type: none"> • Products are based in science. • Products are meeting with success (e.g. plant sterols). • Traceability of products exists. • Crops are grown on spec (ordered by characteristics and benefits).
Regulations	<ul style="list-style-type: none"> • There is standardized labelling. • There is a stable regulatory environment. • GMP, ISO, Identity Preservation is standard.
Market/Consumers	<ul style="list-style-type: none"> • Consumers are more informed. • Products are being sold over the internet. • A small anti-establishment segment still exists.
Research	<ul style="list-style-type: none"> • The medical community is more integrated with the nutrition industry. • Pharma genomics is developed.

4.3 Future Technology Needs of the Industry

If the industry is to reach that vision, the participants discussed the technological needs that will be required by the industry which are:

- Marketing of technology;
- Need to commercialise technology that has been developed;
- New technologies for processing of small quantities;
- Applications of genomics (including veterinary and animal applications);
- Clinical and preclinical trials;
- Increased multi-disciplinary collaborations;
- Fee-for-service research capabilities offered to industry;
- Increased collaboration among the regions (Universities of Laval, Manitoba and Saskatchewan);
- Need for educating/retraining people for the industry;
- Development of regulatory, marketing, finance and production expertise;

- Need for a link between health and agriculture;
- Need to develop “state of the art science” that will brand Canada as a leader in:
 - Metabolic profiling;
 - Genomics;
 - High throughput screening;
 - Bioinformatics;
 - Proteomics;
 - Biosecurity.

Other technological needs of the future were identified as:

- Efficacy testing (GCP, toxicity tests) and statements attesting to efficacy;
- Developing internal company standards (processing standards);
- Need for investors to drive the industry (which must be based in science and IP);
- Developing logistics technology;
- Solving the problem of “taste” (ensuring the functional ingredient in a food product is masked);
- Developing delivery mechanisms (ensuring solubility);
- Developing microencapsulation and packaging technologies;
- Developing metabolic technologies that produce substances that “are good for you”, are non GMO and are applied directly to plants without collateral damage;
- Developing processing technologies such as fractionation, wet / chemical and interaction technologies (along with developing the trained personnel to use the technologies);
- Developing science that will use existing equipment (will require some new processes);
- Developing technologies that have veterinary and animal applications because:
 - Regulatory issues are less stringent;
 - Owners want to feed their pets rather than inject them
 - There is a need for replacement technologies for food animals (including fish) that solve health issues.
- Shifting agricultural production science and technology from quantity to quality;
- Developing new technologies that focus on premium products; and
- Developing mechanical harvesting for herbs.

It was noted that the industry is not comprised of a uniform set of products and therefore identifying a specific, prioritised set of technologies is difficult.

4.4 Meeting Future Technological Needs of the Industry

The participants were asked to consider what it would take to get the industry to meet the technological needs of the future. Their responses included:

- Money (granting agencies need to focus on science);
- Networking and collaboration among stakeholders;
- Multi disciplinary and multi stakeholder implementation teams (need for a blueprint for collaboration that will focus on developing strategic alliances to increase efficiencies in the industry);
- Need to identify global and country specific research activities (access databases);
- Need to develop pathfinding capabilities;
- Need to link networks;
- Need to address institutional constraints (bureaucratic roadblocks);
- Need for due diligence on the science; and
- Discard the concept of matching dollars for research.

The participants noted the following activities were needed in meeting the future technological needs:

1. Development of resource manuals for scientists and managers of scientists that assesses the need of certain products;
2. Establishment of public and private sector networks and collaborations; and
3. Targeted public funding (for areas that address specific needs).

It was also noted that SMEs need:

- Assistance in commercialisation;
- Money;
- Expertise;
- Funding for development and field trials;
- Partners to take products to market; and
- Building the “right team from the beginning”.

4.5 The Way Forward

The participants suggested that the following considerations be given in developing a strategy for meeting the technological needs:

- Develop a national vision;
- Examine various models including virtual models (e.g. Genomics Canada, value chains, the USDA model that joins the medical faculties at Boston University and Universities of Chicago and Illinois);
- Build the “business case”;
- Involve the medical/health community; and
- Consider a role for an advisory/education committee that allows for interaction between scientists and business people.

The final note was that venture capital companies must drive the industry.

5. FOCUS GROUP RESULTS- Vancouver

The following section summarizes the information derived from the focus group of 9 participants at the Vancouver focus group held on May 10, 2002.

5.1 Current State of the Industry

The participants were first asked to describe a picture of the current industry in Canada. Their responses were:

- A growing industry (some discussion among the participants as to whether the statement is valid);
- Diverse and fractured;
- Produce for the export market;
- Comprised of many SMEs;
- No cohesiveness;
- British Columbia production of medicinal herbs exported to the rest of Canada;
- Fruit products flowing through the functional food segment;
- A dying food processing industry;
- Food processors moving into functional foods;
- U.S. becoming a player in the B.C. food industry;
- Industry facing efficacy issues (certificate of analysis no longer “holds weight”);
- Perception of superior quality for Canadian oils;
- Growth in importance of organic products (herbs, fruit, vegetables);
- Lack of research and development into indigenous plants/products;
- Lack of uptake of research by industry;
- Difficult to sell everything on the fresh market;
- Need for standardization;
- Marine sector on the west coast limited to one company sourcing raw materials from the U.S. due to insufficient Canadian quantities;
- Marine sector:
 - Conducts R&D internally;
 - Processing being conducted in Summerland.

The group was asked to identify the **current technology needs** of the industry. The participants noted:

- Lack of money;
- Difficulty in understanding the path to processing (companies understand the problem that needs to be addressed but not the path to solving the problem);
- Need to identify what technologies are needed and where to access the equipment;
- Lower cost process development needed (e.g. extrusion equipment, super critical applications);
- Need to streamline processes;

- Marketing related issues;
- Decreasing costs for standardized methods;
- New ways to highlight/promote functional properties;
- Identifying technology that enhances combinations of products
(e.g. grape seed + blueberry = more effective antioxidant);
- Need for access to/development of in-house expertise;
- Transferring technology;
- Identifying active ingredients and understanding synergies in all biological sources;
- Identifying markers in relation to specific diseases;
- Undertaking costly clinical trials (U.S. undertaking the trials);
- Need for reducing time to develop technologies in order to protect IP;
- Need for finding “the right alliance”; and
- Need to exploit opportunities arising from research.

The participants identified the following **priority technology issues** facing the industry:

1. Undertaking costly clinical trials;
2. Identifying markers in relationship to specific diseases;
3. Decreasing costs for standardized methods;
4. Need for access to/development of in-house expertise;
5. Need for finding “the right alliance”;
6. Need to exploit opportunities arising from research.

5.2 The Vision of the Industry in 2010

The participants were then asked to look into the future and describe the industry in 2010. Their responses are outlined in the following table.

The Vision of the Industry in 2010

Function	Description
Industry	<ul style="list-style-type: none"> • The industry is represented by a strong organization. • The industry is cohesive. • There are fewer, larger companies (vertical integration has happened). • There are more university spin-off companies. • There is an innovative mindset in the industry.
Products	<ul style="list-style-type: none"> • There are more functional foods and fewer supplements. • There are more natural foods than supplements. • Products are based on herbs, marine material, and berries. • Products are sold over the internet. • Another term for “functional” will be used. • Better quality products are marketed. • More marine products are marketed. • Biotech products are embraced (GMO will be a subset of functional foods). • Products are standardized. • Quality products are produced and receive premium prices.
Regulations	<ul style="list-style-type: none"> • CODEX is applied globally. • Regulations are in place. • Terms are applied consistently across sectors (definition of GMO is the same). • Organic certification is in place. • GMP, GLP, ISO, lab accreditation are in place resulting in consumer trust.
Market/Consumers	<ul style="list-style-type: none"> • “Supernatural B.C.” drives exports. • There is world wide recognition of the value of organic. • Market demand has increased. • Consumers are well educated.
Research	<ul style="list-style-type: none"> • Innovators have identified new bioactives. • Research has been done into interactions between bioactives and drugs. • A partnership has developed with the B.C. Cancer Institute that identifies bioactives into cancer.

5.3 Future Technology Needs of the Industry

If the industry is to reach that vision, the participants discussed the technological needs that will be required by the industry which are:

- Customized tracking technologies;
- Nutrigenomics;
- Ability to extract, purify and package various formulas;
- Molecular pharming (supercritical analysis);
- Need to develop/produce foods that address the wellness concept;
- Need to add value to non food uses (e.g. cosmeceuticals, ethanol/biofuels, bioactives from residue);
- Need to develop technologies that address food safety issues in relation to diseases and that will guarantee a safe food supply (need for higher standards);
- Identify technologies for the non chemical processing of vitamin C.

When the participants were pressed to select **priority areas** of technology that must be addressed, they concluded that there are no new technologies that must be developed. This issue is rather to look at **new applications of current technologies**.

5.4 Meeting Future Technological Needs of the Industry

The participants were asked to consider what it would take to get the industry to meet the technological needs of the future. Their responses included:

- Resources must be used better/funding is required.
- The industry will focus on higher value added products.
- The technology must be created.
- Opportunities must be recognized by:
 - “Thinking outside the box”;
 - Identifying a vision; and then
 - Developing technologies or using different applications of current technologies.
- Technologists must be connected with the marketers.
- Multiple applications of technologies must be developed.
- Innovations are needed in fractionation technology.
- There is a need for technology transfer.
- Efficacy must be examined (relationship and interaction between and among multiple ingredients).
- The profile of nutraceuticals must be changed so that they are perceived as being based in science.
- Functional foods must be made proprietary.
- Science must be developed rather than technology.

In addition, they noted the issue of technology transfer. They suggested that an effort must be made to promote the ability to create spin-off companies from university and research organizations. They believed that this will only happen with increased communication among the various agencies.

5.5 The Way Forward

The participants suggested that in order to meet the technological needs of the future, the number of spin-off companies from universities and research organizations will need to be increased. They suggested that the value chain model be considered with players in the chain from organizations such as NSERC, IRAP, AAFC, universities, foreign companies, the financial community (trust funds and venture capital companies).

The value chain would provide services such as pathfinding. In addition a standard formula would be used on how spin-off companies would pay off their debt and secure equity financing. In addition, the group suggested an incubation centre be established to assist the spin-off companies.

The group participants also suggested examination of the wine industry model in British Columbia.

Final comments of the group were:

- Money will be required to meet the industry needs.
- A Canada wide industry organization is required.
- The medical community must be engaged in the vision.
- Science will drive the industry.

APPENDIX A – Focus Group Participant List

Facilitator – Mary Ellen Hodgins - Hodgins & Company
Researcher Team – Lucie Couturier – KPMG, Quebec
Andre Gosselin – Laval University
National Research Council Representative – Guy Felio

Toronto:

1. Valerie Bell – Valerie Bell Consulting
2. Bill Bettger – Guelph University
3. Steve De Brabandere – Foragen Technologies Management Inc.
4. Kelley Fitzpatrick – Saskatchewan Nutraceutical Network
5. David Gauthier – Foragen Technologies Management Inc.
6. Bruce Holub – Guelph University
7. Leesa Nacht – Regulatory Affairs
8. Robert Orr – Ocean Nutrition
9. Marcel Pitinio – Food Nutrition Inc.
10. Greg Poushinski – Agriculture and Agri-Food Canada
11. Angele St-Yves – Food Research and Development Centre – Saint Hyacinthe

Saskatoon:

1. Sheika Agblor – Saskatchewan Agriculture Food and Rural Revitalization
2. David Bailey – Agriculture and Agri-Food Canada
3. Harold Bjarnson – University of Manitoba
4. Wayne Craig – IRAP
5. Ken Evans – Saskatchewan Agriculture Food and Rural Revitalization
6. Marianne Greer – Saskatchewan Drug Research
7. Bryan Harvey – University of Saskatchewan
8. Joan Heath – Saskatchewan Canola Development Commission
9. Bernie Jurrlink – University of Saskatchewan
10. Kutty Kartha – PBI
11. Connie Kehler – Saskatchewan Herb & Spice Association
12. Wilf Keller - PBI
13. Danya Kordan – Saskatchewan Economic & Co-operative Development
14. Armand Lavoie – Foragen Technologies
15. Mark Paslowski – Fytokem
16. Dan Prefontaine – Saskatchewan Food Industry Development Centre
17. Melanie Rozwadowski – University of Saskatchewan
18. Roy Sangster – Sangster Health Products
19. Gopalan Selvaraj – PBI
20. Eryn Siba – Hodgins & Company
21. Al Slinkard – University of Saskatchewan
22. K. Sosulski – Saskatchewan Research Council
23. Janice Tranberg – Performance Plants

24. Neil Westcott – Agriculture and Agri-Food Canada

Vancouver:

1. Maureen Atanaka - IRAP
2. James Wilken - IRAP

3. Ken Evans – Saskatchewan Agriculture Food and Rural Revitalization
4. Joji Ishikawa – Omega Nutrition Canada Inc.
5. Bernadette Mah
6. Marian Ng – International Chitin Production
7. Susan Rooney – SISU Enterprises Inc.
8. Dave Oomah – Pacific Agri-Food Research Centre
9. Christine Watt – Nutraceutical and Functional Food Association

Canadian Technological Roadmap on Functional Foods and Nutraceuticals

Section 5

Technology Supply

September 2002



List of Research Centres

- **Agriculture and Agri-Food Canada (AAFC):**
 - Atlantic Food and Horticulture Research Centre
 - Food Research and Development Centre
 - Horticultural Research and Development Centre
 - Eastern Cereal & Oilseed Research Centre
 - Southern Crop Protection and Food Research Centre
 - Greenhouse and Processing Crops Research Centre
 - Saskatoon Research Centre
 - Lacombe Research Centre
 - Lethbridge Research Centre
 - Pacific Agri-Food Research Centre
- **National Research Council of Canada (NRC):**
 - PEI Bioresources Cluster
 - Institute for Marine Biosciences
 - Institute for National Measurement Standards
 - Institute for Chemical Process and Environment Technology
 - Plant Biotechnology Institute

List of Research Centres

- **Universities and Other Research Centres:**
 - Food Technology Centre, Prince Edward Island University
 - Food Research Centre, Université de Moncton
 - Nova Scotia Agricultural College
 - Marine Biotechnology Research Centre, Rimouski, Quebec
 - Nutraceuticals and Functional Foods Institute, Université Laval
 - Centre for Human Nutrition, University of Western Ontario
 - Guelph Centre for Functional Foods, University of Guelph
 - Human Nutraceutical Research Unit, University of Guelph
 - Guelph Food Technology Centre, Ontario
 - Department of Nutritional Sciences, University of Toronto



List of Research Centres

- **Universities and Other Research Centres:**
 - National Centre for Agri-Food Research in Medicine, St. Boniface General Hospital Research Centre
 - Millennium Centre for Functional Food and Nutraceutical Research, University of Manitoba
 - POS Pilot Plant Corporation, Saskatchewan
 - University of Saskatchewan
 - University of Alberta
 - Food Processing Development Centre, Alberta
 - Olds College Centre for Innovation, Alberta
 - Food Processing Resource Centre, British Columbia Institute of Technology
 - Faculty of Agricultural Sciences, University of British Columbia



Agriculture and Agri-Food Canada



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada



AAFC: Atlantic Food and Horticulture Research Centre

Capsule

The Atlantic Food and Horticulture Research Centre is involved in the development and transfer of technology. Its aim is to improve the horticultural food chain's productivity, competitiveness and stability while ensuring food quality and wholesomeness within a durable agricultural context. It develops new cultivars and new technologies to support production, adaptation and horticultural crop protection. This is done while endeavouring to work out storage and handling methods as well as innovating treatment.

Location

32 Main Street, Kentville, Nova Scotia B4N 1J5

Telephone: (902) 679-5757 Facsimile: (902) 679-2311

Email: johnsonw@em.agr.ca Website: <http://res.agr.ca/kentville>



AAFC: Atlantic Food and Horticulture Research Centre

Expertise

- Small fruits: wild blueberries, strawberries, others
- Orchard fruits: production, protection
- Conditioning, wholesomeness and quality, processing and distribution
- Vegetables

Technological Infrastructure

- Sensorial analysis
- Food technology and chemistry
- Post-crop storage
- Electronic microscopy
- Establishment of pilot food processing plant of 6,500 m²



AAFC: Food Research and Development Centre

Capsule

The Centre is active in furthering our knowledge of the food systems and in supporting innovation and growth of the Canadian food industry. This includes having access to its human resources, its documentary infrastructures and its sources, and by the transfer of knowledge and technologies.

Location

3600 Casavant Boulevard West, St Hyacinthe, Quebec J2S 8E3

Telephone: (450) 773-1105 Facsimile: (450) 773-8461

Web site: http://sci.agr.ca/crda/info_e.htm



AAFC: Food Research and Development Centre

Expertise

- Bio-ingredients
- Processing of dairy products, meat and plant products

Technological Infrastructure

- Material used to measure the permeability of packing materials
- Analysis of thermal penetration
- Small scale irradiation
- Experimental kitchen and computerized sensory evaluation laboratory
- Forty controlled atmosphere rooms
- Microbiology, biotechnology, biochemistry, physiology, instrumental chemistry laboratories



AAFC: Horticultural Research and Development Centre

Capsule

The Horticultural Research and Development Centre of St Jean sur Richelieu is specialized in field vegetable cultures. The Centre meets the research needs in production, protection and conservation of vegetable cultures.

Location

430 Gouin Boulevard, St Jean sur Richelieu, Quebec J3B 3E6

Telephone: (450) 346-4494 Facsimile: (450) 346-7740

Web site: <http://res2.agr.gc.ca/stjean/index.htm>



AAFC: Horticultural Research and Development Centre

Expertise

- Vegetable production and plant protection
- Precision agriculture
- Biological control
- Extraction and characterization of essential oils

Technological Infrastructure

- Laser topography
- Greenhouses, growth rooms and reproduction rooms
- Three experimental farms



AAFC: Eastern Cereal & Oilseed Research Centre

Capsule

This research centre is dedicated to grain production. It works with the characterization of cereal components with added value. When available, the Centre develops cultivars adapted to production in Eastern Canada. It is also in charge of launching all lines of corn developed by Agriculture and agri-Food Canada.

Location

Central Experimental Farm

960 Carling Avenue, Ottawa, Ontario K1A 0C6

Telephone: (613) 759-1952

Facsimile: (613) 759-1970

Email: deschenesjm@em.agr.ca

Web site: <http://res2.agr.ca/ecorc>



ECORC

**Eastern
Cereal & Oilseed
Research Centre**

AAFC: Eastern Cereal & Oilseed Research Centre

Expertise

- Grain crops
- Molecular biology and agronomy
- Mycology, botany and entomology
- Biodiversity

Technological Infrastructure

- Electron microscopes with transmission and analysis of the environment
- Optical microscope and imagery system
- Micro-spectrophotometer
- Magnetic resonance spectrometer of high resolution and mass



AAFC: Southern Crop Protection and Food Research Centre

Capsule

The Centre specializes in the development of pro-biotic and functional foods due to the active research programs on ginseng and stevia. These programs have as principal objectives to improve the production practices and to prepare genetic material for these cultures.

Multidisciplinary teams carry out research programs of the Southern Crop Protection and Food Research Centre (SCPFRC) in London, Guelph, Vineland and Delhi.

The group responsible for Quality and Processing of the Food Improvement Program is located at the University of Guelph.

Location

1391 Sandford Street, London, Ontario N5V 4T3

Telephone: (519) 457-1470 Facsimile: (519) 457-3997

Web site: <http://res2.agr.ca/london/pmrc>



AAFC: Southern Crop Protection and Food Research Centre

Expertise

- Fruits, vegetables and medicinal plants
- Genomic and biotechnology
- Large-scale farming, soil and quality of the environment

Technological Infrastructure

- Experimental farms
- Greenhouses, incubation rooms
- Soil characterization
- Analytical instrumentation



AAFC: Greenhouse and Processing Crops Research Centre

Capsule

The Centre develops and transfers new technologies relative to greenhouse vegetable production (tomatoes, cucumbers and sweet peppers), soya, white broad beans and field vegetables cultivated for processing. Research on management, quality and characterization of the soils of Ontario constitutes a significant activity in the Centre. It also expects to examine the qualitative and nutraceutical aspects of food and new products.

Location

2585 County Road 20, Harrow, Ontario N0R 1G0

Telephone: 519-738-2251 Facsimile: 519-738-2929

Email: harweb@em.agr.ca Web site: <http://res.agr.ca/harrow>

The logo for the Greenhouse & Processing Crops Research Centre is located at the bottom of the slide. It features the text 'Greenhouse & Processing Crops' on the top line and 'Research Centre' on the bottom line, both in a bold, orange, sans-serif font. The text is set against a solid green rectangular background.

AAFC: Greenhouse and Processing Crops Research Centre

Expertise

- Vegetables grown in greenhouses and for processing
- Soya beans and white beans
- Clones of wild species and approved cultivars

Technological Infrastructure

- 150 ha of sablo-argillaceous soil and 78 ha of clay soil
- Ultra-modern greenhouses covering a surface of 0.6 ha
- Systems of electrophoresis, RFLP, RAPD, PCR, PAGE and chromatography (HPLC and GC)
- Equipment for tissue culture
- Continuous and non-destructive monitoring of the growth of plants and their metabolism



AAFC: Saskatoon Research Centre

Capsule

The Saskatoon Research Centre works with the improvement of the germ **plasm** of oilseed and forage crops. It sees to the development of crop production and pest control practices for the Parkland region, processes and products that expand the utilization **for the Prairies**. The Centre also sees to the expansion of new cultures in the Prairies.

Location

107 Science Place, Saskatoon, Saskatchewan S7N 0X2

Telephone: (306) 956-7200 Facsimile: (306) 956-7247

Web site: <http://res2.agr.ca/sask>



AAFC: Saskatoon Research Centre

Expertise

- Improvement of plants and diversification
- Molecular biology
- Plant protection
- Long-term agriculture: Diversification of cultures and environment management
- Phylogenetic resources of Canada in particular the world collection of barley and oats of Plant Gene Resources of Canada
- Bioproducts and process development

Technological Infrastructure

- Experimental farms
- Molecular biology and genetic engineering
- Brassica elite genetic material
- Chemistry of natural products in order to increase the possibilities of adding value to plants
- Containment installations of the evolutionary pathogenic agents of insects and plants, and laboratories of microbial fermentation for R&D of biopesticides
- Herbarium and collection of insects



AAFC: Lacombe Research Centre

Capsule

The Lacombe Research Centre has a national mandate to conduct research on:

- The ante- and post-mortem factors (quality, harmlessness and conservation), which influence the quality of red meat products
- Beekeeping

In liaison with its affiliated sites and research partners, the Centre develops vegetable and animal durable production integrated systems and it creates adapted varieties with short-season environment cycles for the Prairies and Northwestern Canada.

Location

6000 C & E Trail, Lacombe, Alberta T4L 1W1

Telephone: (403) 782-8100

Facsimile: (403) 782-6120

Email: destremya@em.agr.ca

Web site: <http://res2.agr.ca/lacombe>



AAFC: Lacombe Research Centre

Expertise

- Animal production and processing
- Plants and soils

Technological Infrastructure

- Installations for beef and pig breeding for the Prairies and Northwest Canada
- A greenhouse, growth chambers, dryers, threshing-machines and storage cells for seeds
- Analysis laboratory



AAFC: Lethbridge Research Centre

Capsule

The Lethbridge Research Centre devotes its efforts in cereal cultures and leguminous plants. Its research program aims at the development of improved cultivars, biological disease and pest control. The Centre is interested in a durable development of agriculture.

Location

5403 - 1st Avenue, P.O. Box 3000, Lethbridge, Alberta T1J 4B1

Telephone: (403) 327-4561

Facsimile: (403) 382-3156

Email: lethbridge@em.agr.ca

Web site: <http://res2.agr.ca/lethbridge>



AAFC: Lethbridge Research Centre

Expertise

- Cereal and leguminous cultures
- Genomics
- Biological control and integrated pest management
- Characterization of diseases, infestation prediction system/epidemiology
- Durable development

Technological Infrastructure

- Experimental farms
- Incubation and culture space
- New cultivars



AAFC: Pacific Agri-Food Research Centre

Capsule

The Pacific Agri-Food Research Centre (PARC) food research group studies the chemical, physical, organoleptic properties and fundamental microbiology of fresh and processed fruits, vegetables and medicinal plants.

Location

4200 Highway 97, Summerland, British Columbia V0H 1Z0

Telephone: (250) 494-7711 Facsimile: (250) 494-0755

Email: parc@em.agr.ca Web site: <http://res2.agr.ca/parc-crapac/english/parc.htm>



Pacific Agri-Food Research Centre

Centre de Recherches Agroalimentaires du PACifique

AAFC: Pacific Agri-Food Research Centre

Expertise

- Physical properties of fruits and vegetables
- Sensory evaluation
- Food microbiology
- Processing of foods
- Non-food uses of agri-food products
- Post-harvest physiology

Technological Infrastructure

- Site of 320 ha of which roughly 90 ha are irrigated and available for research
- Modern laboratory
- Research greenhouses



Agriculture and Agri-Food Canada (AAFC)

	Atlantic Food and Horticulture Research Centre	Food Research and Development Centre	Horticultural Research and Development Centre	Eastern Cereal & Oilseed Research Centre	Southern Crop Protection and Food Research Centre
Location	Kentville, Nova Scotia	St Hyacinthe, Quebec	Saint Jean sur Richelieu, Quebec	Ottawa, Ontario	Guelph, Delhi London, Vineland
Specialties	fruits and vegetables	milk products, meat products, fruits and vegetables	fruits and vegetables	cereals, oleaginous	fruits and vegetables, cereals medicinal plants
Genomics, proteomics and bioinformatics			X	X	X
Production and primary processing	X		X	X	X
Processing, formulation and food production	X	X			X
Extraction, purification and characterization	X	X		X	X
Nutritional and toxicological studies (clinical assays)					
Bioassay platforms					
Short serie production for commercialization of functional foods and nutraceuticals		pilot plant			



Agriculture and Agri-Food Canada (AAFC)

	Greenhouse and Processing Crops Research Centre	Saskatoon Research Center	Lacombe Research Centre	Lethbridge Research Centre	Pacific Agri-Food Research Centre
Location	Harrow, Ontario	Saskatoon, Saskatchewan	Lacombe, Alberta	Lethbridge, Alberta	Summerland, British Columbia
Specialties	vegetables, soya	field crops	meat products	beef, cereals	fruits and vegetables, medicinal plants
Genomics, proteomics and bioinformatics	X	X	X	X	X
Production and primary processing	X	X	X	X	X
Processing, formulation and food production					X
Extraction, purification and characterization	X	X	X	X	X
Nutritional and toxicological studies (clinical assays)					
Bioassay platforms					
Short serie production for commercialization of functional foods and nutraceuticals					



Agriculture and Agri-Food Canada (AAFC)

Summary

1. Mostly involved at the production, transformation and characterization levels
2. Three principal research installations active in the FFN:
 - Food Research and Development Centre (St Hyacinthe)
 - Southern Crop Protection and Food Research Centre (London, Guelph, Vineland and Delhi)
 - Pacific Agri-Food Research Centre (Summerland)
3. Networks on bioproduct (and bioprocess) and food safety
4. Creation of a research database in FFN

National Research Council of Canada



NRC: PEI Bioresources Cluster

Capsule

The vision is to establish a recognized Atlantic Region Cluster based in Prince Edward Island (PEI) for the discovery, development and commercialization of high-value bioactive compounds from Atlantic marine natural resources as well as other regional plant-based bioresources for human and animal health and nutrition.

Location

To be established in Prince Edward Island



NRC: PEI Bioresources Cluster

Expertise

- Marine natural resource
- Region plant-based bioresource
- Research capacity in all aspects of bioactives from initial discovery to enhancement of efficacy
- Recognized nucleus of commercial activity in bioactives, both in PEI and the broader Atlantic Region
- Joint expertise with Atlantic Veterinary College

Technological Infrastructure

- Building on an existing research capacity, infrastructure and innovative industrial base in PEI and Atlantic Canada
- The scope of the total activity level is estimated at CA \$20 million a year within five years



NRC: Institute for Marine Biosciences

Capsule

The Institute carries out strategic and commercial research in aquiculture of fish, shellfish and sea plants. It contributes to the maintenance of Canada's reputation for the quality and safety of sea products, by their research on marine toxins and development of standards and certified materials of reference. It is responsible for the exploitation and administration for the Canadian Bioinformatics Resource (CBR) for NRC, a national installation giving access to biotechnology data bases and software on bioinformatics.

Location

1411 Oxford Street, Halifax, Nova Scotia B3H 3Z1

Telephone: (902) 426-8332

Facsimile: (902) 426-9413

Email: cathy.gibson@nrc.ca

Web site: <http://www.imb.nrc.ca>



NRC: Institute for Marine Biosciences

Expertise

- Marine toxins and toxigenic marine micro algae
- Aquicolous biotechnology (technologies of culture, microbiology)
- Analytical chemistry
- Cellular and molecular biology
- Genomics (bioinformatics, proteomics)

Technological Infrastructure

- Advanced mass spectrometers and spectroscopy RMN
- Automated equipment of synthesis and sequencing of DNA
- Installation of GLP chemistry for the studies in support of requests for regulation
- Photonic microscopy and electronics (ESM) with variable pressure with microanalysis by x-rays, electronic microscopy with transmission on cryo-platinum with microanalysis by x-rays, and microscopy optics and of fluorescence coupled with imaging analysis)
- Research stations into aquicolous and maricole of fish, seafood and sea plants as well as tanks with controlled environments and photoreactors for micro-organism culture



NRC: Institute for National Measurement Standards

Capsule

The Institute for National Measurement Standards gathers within the NRC research activities attached to metrology, in order to provide the bases of the National Measurement Standards of Canada, an essential resource for the Canadian company. The chemical program of metrology works out and maintains capacities at the international level in selected fields of organic and inorganic analysis traces, provides certified substances of reference and begins related research.

Location

Montreal Road, Building M-36, Ottawa, Ontario K1A 0R6

Telephone: (613) 993-9363 Facsimile: (613) 952-1394

Web site: <http://www.cnrc.ca/inms>

NRC: Institute for National Measurement Standards

Expertise

- Metrology
- Analytical chemistry
- Trace element and organometal contaminant analysis
- Trace analysis of organochlorine compounds, dioxins and furans
- Preparation and certification of reference materials

Technological Infrastructure

- Advanced mass spectrometers for organic and inorganic analysis
- National facility for glow discharge mass spectrometry
- Clean rooms for inorganic trace analysis
- Extraction techniques (Accelerated solvent extraction, microwave, supercritical fluid extraction)



NRC: Institute for Chemical Process and Environment Technology

Capsule

The Institute for Chemical Process and Environment Technology (ICPET) develops chemical process technologies and value-added materials to help Canadian industries improve the commercial viability of their products, reduce costs, manage environmental performance and increase the efficacy of process operations. ICPET has established a strong base of expertise in separation technology using novel membrane materials and processes. Research focuses on non-thermal processing applications as well as refining, purifying and concentrating process streams for food and nutraceutical products.

Location

Montreal Road, Ottawa, Ontario K1A 0R6

Contact: Raymond Gaetan

Telephone: (613) 998-3472

Web site: <http://www.nrc.ca/icpet>



NRC: Institute for Chemical Process and Environment Technology

Expertise

- Process technologies
- Process development, including the extraction and fractionation of natural products
- Development of analytical techniques for natural products
- Functional materials
- Modeling and design
- Environmental management

Technological Infrastructure

- Semi-automated pilot scale RO/NF/UF/MF units capable of handling commercial size modules
- High-temperature, pilot-scale plate and frame system
- Commercially-available laboratory-scale membrane test
- Integration of membranes into existing separation schemes



NRC: Plant Biotechnology Institute

Capsule

The Plant Biotechnology Institute (PBI) carries out research on plants and crops. The PBI is a leader in metabolic modification of the oilseeds to increase the content of oil and quality. PBI is also a Canadian leader in plant genomics.

Location

110 Gymnasium Place, Saskatoon, Saskatchewan S7N 0W9

Telephone: (306) 975-5248

Facsimile: (306) 975-4839

Email: kutty.kartha@nrc.ca

Web site: <http://www.pbi.nrc.ca>



NRC: Plant Biotechnology Institute

Expertise

- Metabolic modification of the oilseeds
- Study of the metabolic pathways
- Improvement of the agronomic performance of crops
- Genomics and proteomics

Technological Infrastructure

- A DNA analyzer by capillary electrophoresis (ABI PRISM 3700)
- Three additional DNA ABI sequencers
- Robotics to carry out the chemical process of DNA sequencing
- Three DNA synthesisers, an Applied Biosystems Model 394 and two Beckman Oligo 1000M units
- Mass spectrometer and nuclear magnetic resonance
- Air-conditioned and automated greenhouses occupying 6,000 square feet



National Research Council of Canada

	Institute for Marine Biosciences	Institute for National Measurement Standards	Institute for Chemical Process and Environment Technology	Plant Biotechnology Institute*
Location	Halifax, Nova Scotia	Ottawa, Ontario	Ottawa, Ontario	Saskatoon, Saskatchewan
Specialties	marine biology	metrology, analytical chemistry	process technologies, food and natural products	plants and crops
Genomics, proteomics and bioinformatics	X	X		X
Production and primary processing	X			X
Processing, formulation and food production	X			
Extraction, purification and characterization	X	X	X	X
Nutritional and toxicological studies (clinical assays)				
Bio-assay platforms				
Short serie production for commercialization of functional foods and nutraceuticals			pilot plant	

* Responsible for the research network on functional foods and nutraceuticals in Canada.



National Research Council of Canada

Summary

1. Canadian leader in genomics, proteomics and bioinformatics.
2. FFN technological cluster (Western provinces) lead by the Plant Biotechnology Institute.
3. A possible new technology cluster in Eastern Canada.



Universities and Other Research Centres



Food Technology Centre

Capsule

The Food Technology Centre of Prince Edward Island offers its customers a state-of-the-art infrastructure for the development of new processes and new products. The Centre also offers a range of related services: microbiology analysis, laboratories, nutritional service, sensory analysis, etc.

Location

P.O. Box 2000, Charlottetown, Prince Edward Island C1A 7N8

Telephone: (902) 368-5548 Facsimile: (902) 368-5549

Email: peifc@gov.pe.ca Web site: <http://www.gov.pe.ca/ftc>

Located at the Prince Edward Island University.



Food Technology Centre

Expertise

- Development of products
- Organoleptic analysis
- Nutritional labeling
- Food safety

Technological Infrastructure

- Instrumentation laboratory
- Microbiology and chemistry laboratories
- Product development laboratory
- Data line control system
- Processing pilot plant of marine and agri-food products (ISO 9001)



Centre de recherche sur les aliments, Université de Moncton (Food Research Centre)

Capsule

The Food Research Centre is dedicated to research in food and the delivery of services to the food industry of the Atlantic, particularly that of New Brunswick. Its goal is to serve the processors in what regards industrial research, development of new products, chemical, microbiological and sensory analysis. The Centre offers quality services in agri-food and marine products. The Food Research Centre wants to direct its services towards small and medium-sized companies, add to their resources and to catalyze the technological innovation.

Location

Pavillon Jacqueline-Bouchard, Moncton, New Brunswick E1A 3E9

Telephone: (506) 858-4284

Facsimile: (506) 858-4540

Email: cra@umoncton.ca

Web site: <http://www.umoncton.ca/cra>



Expertise

- Product development and technical services
- Chemistry and microbiology analytical services
- Sensory evaluation
- Assistance as regards to Hazard Analysis and Critical Point (HACCP) and quality control methods
- Thermal study

Technological Infrastructure

- Automated temperature recording system
- Gas and liquid chromatography
- Infra-red UV and visible spectrophotometry
- Automated analysis of proteins, lipids, soluble and insoluble fibres
- Automated bacteriological identification system
- Bactometer, automated microbial detection system



Nova Scotia Agricultural College

Capsule

Nova Scotia Agricultural College (NSAC) is a famous educational establishment of the agricultural sector. This organization carries out a research program in the agri-food sector. The establishment is implicated in vegetable, livestock production research and food processing.

Location

P.O. Box 550, Truro, Nova Scotia B2N 5E3

Telephone: (902) 893-6722 Facsimile: (902) 895-5529

Web site: <http://www.nsac.ns.ca>



Nova Scotia Agricultural College

Expertise

- Livestock management
- Production and processing of fruits and vegetables
- Phytoprotection
- Product quality

Technological Infrastructure

- Development of data-processing management tools
- Experimental infrastructure of agricultural production
- Agricultural product characterization



Marine Biotechnology Research Centre

Capsule

The Marine Biotechnology Research Centre will be equipped with a scaling platform of marine products with high added value. This non lucrative corporation will be located near the Université du Québec in Rimouski. It will centre its research on cold water bioactive molecules of the estuary of the St. Lawrence River whose properties include anticancer genes, immune stimulants and anti bacterial.

Location

To be built in 2002 – 2003 in Rimouski in the province of Quebec.



Marine Biotechnology Research Centre

Expertise

- Marine bioactive molecules
- Collaboration with the Institut des sciences de la mer (ISMER) and the Cancer Association of Eastern Quebec

Technological Infrastructure

- Characterization of bio-ingredients
- Biology, physiology and process engineering
- Pilot extraction unit, conditioning and processing



Capsule

The Nutraceuticals and Functional Foods Institute gathers scientists whose various competencies and expertise are made available to advance knowledge in the field of FFN. More specifically, the researchers are interested in the effects of FFN on the prevention of the chronic diseases, such as obesity, cardiovascular diseases, diseases related to immunity and various cancers. It also sets up a network of competences able to meet the industry's needs. The current efforts aim at developing new effective methods of extraction and purification, with the characterization of bioactive molecules, development of nutritive functional foods supporting the prevention of diseases. In addition, the Institute concerns itself with informing the public and consumers of the implications and the benefits of FFN. The practice and marketing strategies analysis is also part of the Institute's mandate.

Location

Pavillon Paul-Comtois
Room 2412, Sainte-Foy, Quebec G1K 7P4

Telephone: (418) 656-3527 Facsimile: (418) 656-5877

Email: info@insf.ulaval.ca

Web site: <http://www.inaf.ulaval.ca>



Agriculture et
Agroalimentaire Canada

Agriculture and
Agri-Food Canada



Institut des nutraceutiques et des aliments fonctionnels

Université Laval

(Nutraceuticals and Functional Foods Institute)

Network Members

This research centre will gather about fifty researchers from:

- Université Laval, three faculties (agricultural and food sciences, medicine and pharmacy)
- Université du Québec in Montréal
- Université du Québec in Chicoutimi
- Université du Québec in Trois-Rivières
- Agriculture and agri-Food Canada
- Centre collégial de transfert en biotechnologies du cégep Lévis-Lauzon (TransBioTech)
- McGill University
- Université de Montréal
- Université de Moncton
- Institut Armand-Frappier

Four chairs in Canada are related to the programming of the Nutraceuticals and Functional Foods Institute:

- Chair Lacroix in lacteous bacteria
- Chair Subirade in encapsulation
- Chair Lamarche in nutrition
- Chair Tremblay in nutrition

One chair in genomics (Sirard) is also complementary to certain work of the Institute.



Institut des nutraceutiques et des aliments fonctionnels

Université Laval

(Nutraceuticals and Functional Foods Institute)

Expertise

- Functional foods, nutraceuticals, cosmeceuticals
- Nutritional and clinical trials
- Dairy and horticultural products
- Genomics and proteomics
- Chemistry, processing and formulation

Technological Infrastructure

- State-of-the-art molecular biology laboratory conforms to GLP and GCP
- Modern biochemistry laboratory intended for sifting, extraction, purification and characterization of bioactive molecules with a nutraceutical potential
- Metabolic evaluation, with calorimetry room, physiological study units and intervention rooms for clinical studies
- Installations adapted to the production of transgenic plants under containment
- Network of growth rooms and ultramodern greenhouse complex
- Modern animal care house and surgery rooms
- Pilot laboratory dedicated to food processing, which includes separation installations, large scale purification and fractioning, fermentation, freeze-drying, leak detection and aseptic packing
- Molecular analysis laboratories



Centre for Human Nutrition, University of Western Ontario

Capsule

The purpose of the Centre is to support and coordinate research on nutrition carried out at the University of Western Ontario by focusing on cardiovascular diseases and cancer. The Centre acts as a resource on subjects related to nutrition for the public, students, researchers and the media. The Centre supports healthy nutrition and distributes information on the subject.

Location

Dental Sciences Building, Office 5010, London, Ontario N6A 5C1

Telephone: (519) 667-6615 Facsimile: (519) 661-4006

Web site: <http://www.uwo.ca/chn>



Centre for Human Nutrition



Centre for Human Nutrition, University of Western Ontario

Expertise

- Research in nutrition on the following subjects: aging, antioxidants, cancer, cardiovascular diseases, diabetes, nutriment-drug interactions, immunizing function, kidney disease, lipids/lipoproteins, neonatal nutrition, obesity/food related problems, osteoporosis, toxicity of heavy metals, vitamins, genetics
- Cellular models and research on animals
- Multidisciplinary approach

Technological Infrastructure

- Clinical trial equipment



Department of Nutritional Sciences, University of Toronto

Capsule

The Department of Nutritional Sciences' mandate is to advance human health by research, teaching and be a pioneer in the field of nutritional sciences. This field extends along a vast continuum going from the molecular mechanisms explaining the nutrients action to promotion strategy optimization of individual and population health. The Department concentrates its research on a better comprehension of the human diet in the reduction of cancer risks, cardiovascular diseases, diabetes and obesity.

Location

Faculty of Medicine, FitzGerald Building

150 College Street, Toronto, Ontario M5S 3E2

Telephone: (416) 978-2422

Facsimile: (416) 971-2366

Email: m.archer@utoronto.ca

Web site: <http://www.utoronto.ca/nutrisci>

DEPARTMENT OF

Nutritional Sciences

FACULTY OF MEDICINE
AT THE UNIVERSITY OF TORONTO



Department of Nutritional Sciences, University of Toronto

Expertise

- Regulation on functional foods, nutraceuticals and allegations of health benefits
- Prevention of colon and breast cancers
- Saponins, phytosterols, polyphenols, lycopene foods, antioxidants, folic acid, diet and its effects on cancer
- Effects of various sources of fibres in the prevention and treatment of cardiovascular diseases and diabetes

Technological Infrastructure

- An expertise in analysis to determine the amino acid content in foods, fatty acids, glucides, proteins, vitamins and minerals
- Animal and human clinical study installations
- Mass spectrometry
- Tissue culture laboratories
- Room for jury tasting
- Processor of deposit



Guelph Centre for Functional Foods

Capsule

The Guelph Centre for Functional Foods' laboratory services include three scientific units: analysis, veterinary hygiene and regulatory services. The laboratory's mandate is to ensure customers of its high quality analyses of functional foods and general food chemistry, molecular biology, analytical microscopy, diagnosis of vegetable diseases, and soil and nutritive elements analysis. The Centre takes part in concerted research, which brings clinical proof of beneficial health effects on functional ingredients of raw and processed foods.

Location

P.O. Box 3650, 95 Stone Road West, Guelph, Ontario N1H 8J7

Telephone: (519) 767-6246

Facsimile: (519) 767-6240

Email: info@ilsd.uoguelph.ca

Web site: <http://www.uoguelph.ca/labserv>



**Laboratory
Services**

**Guelph Centre For
Functional Foods**

Guelph Centre for Functional Foods

Expertise

- Analysis of soya and ginseng based foods
- Microbiology and chemistry of foods
- Drug residue analysis
- Analysis of environment pesticides and contaminants
- Diagnostic of vegetable diseases
- Diagnostic and consultation on zoonosis

Technological Infrastructure

- Analyze by HPLC foods containing soya, ginseng, garlic and garlic supplement, fatty acids, proteins, amino acids, minerals
- Analyze carbohydrates and fibres
- Molecular analysis
- Mass spectrometry (LC/MS)
- Electronic microscopy



Human Nutraceutical Research Unit

Capsule

The research service on nutraceuticals intended for humans seeks to show the effectiveness of FFN and other natural health products during the course of a study on humans (controlled with placebos), in order to support marketing strategies. It is particularly interested in research centered on new foods with added value and beneficial for the health, as well as prevention of diseases and therapeutic management. It evaluates products for which they plead the health virtues, and this, by undertaking controlled studies on humans.

Location

Guelph University

Powell Building, Suite 217, Guelph, Ontario N1G 2W1

Telephone: (519) 824-4120 extension 3749 Facsimile: (519) 821-4007

Email: hnru@uoguelph.ca

Web site: <http://www.uoguelph.ca/hnru>



**Human
Nutraceutical
Research Unit**

Human Nutraceutical Research Unit

Expertise

- Consultation to determine the feasibility of product testing on humans
- Studies on humans including a notification of the subject, preparation of capsules, mixture, design of the study, statistical analyses, the drafting of reports, publication options and cost evaluation
- Blood tests

Technological Infrastructure

- Installation for cardiovascular, immunology and hormonal proportioning for analysis of the fatty acid rate, total antioxidants, amino acids, vitamins and minerals
- Installation for analysis of the diet, organic state of hydration, constitution of the body, bioelectric impedance and physical form
- Weighing under water and VO₂ max test
- Analysis of the abdominal fat composition



Guelph Food Technology Centre

Capsule

This Centre brings confidential creative solutions with a service fee to contractors and companies as regards marketing of new products on the national and international markets.

Location

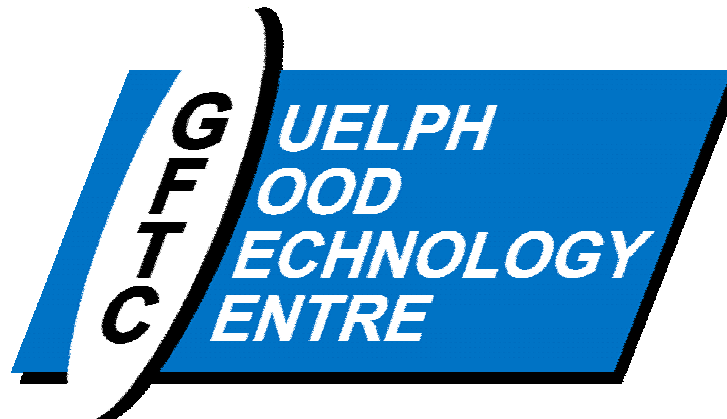
88 McGilvray Street, Guelph, Ontario N1G 2W1

Telephone: (519) 821-1246

Facsimile: (519) 836-1281

Email: gftc@gftc.ca

Web site: <http://www.gftc.ca>



Guelph Food Technology Centre

Expertise

- Development of products and processes
- Applied research and pilot plant services
- HACCP system

Technological Infrastructure

- Biotransformation single installations, in particular in opposite osmosis, freeze-drying, biocentrifugation and separation by membranes, at laboratory and pilot scales
- Heat treatment
- Non standardized analytical support for processes, conditioning and products development



National Centre for Agri-Food Research in Medicine

Capsule

The Centre studies the FFN related health advantages.

Location

351 Taché Avenue, Winnipeg, Manitoba R2H 2A6

Telephone: (204) 235-3414 Facsimile: (204) 231-1151

Dial-free number: (204) 231-1151

Email: gpierce@sbrc.ca

Web site: <http://www.sbrc.ca>



**NATIONAL CENTRE FOR
AGRI-FOOD RESEARCH IN MEDICINE**

St. Boniface General Hospital Research Centre



National Centre for Agri-Food Research in Medicine

Expertise

- Functional foods and nutraceuticals and their effects on:

Cardiovascular, infectious, neuro-degenerative, sleep disorders, respiratory medicine, nephrology, epidemiology, anaesthesia and oncology diseases

Technological Infrastructure

- Laboratory for biochemistry analysis, molecular biology, cellular biology, cellular culture and pharmaceutical studies
- Centrifugal machines and ultracentrifuges
- Chromatography (HPLC) and GC/MS



Millennium Centre for Functional Food and Nutraceutical Research

Capsule

Manitoba will create, by the end of the year 2002, a new centre to become a leader in research and development of FFN. The centre will lodge up to 60 researchers in several fields, including sectors of agriculture, food, human ecology, medicine and pharmacy. The research projects will go from the extraction of beneficial elements from foods to the delivery of the product, passing by production, quality control, packing, etc.

Location

Manitoba

Organization derived from the Faculty of Agriculture and Food Sciences of the University of Manitoba.



Millennium Centre for Functional Food and Nutraceutical Research

Expertise

- Identification, extraction, bioactive molecule characterization
- Cellular culture
- Genetically modified organisms (GMO)
- Quality, biosecurity

Technological Infrastructure

- Production pilot plant
- Clinical trials on small animals



POS Pilot Plant Corporation

Capsule

POS Pilot Plant Corporation (POS) is a private research and development corporation which specializes in bioprocess solutions. POS carries out development of technologies in bioprocesses with added value for certain products such as cereals, vegetable oilseeds, herbs, components and fermentation products. The pilot plant is involved in product extraction, fractioning, purification and transformation.

Location

#1000-118 Veterinary Road, Saskatoon, Saskatchewan S7N 2R4

Telephone: (306) 978-2800

Facsimile: (306) 975-3766

Email: pos@pos.ca

Web site: <http://www.pos.ca>



POS Pilot Plant Corporation
118 Veterinary Road
Saskatoon SK
Canada S7N 2R4

Tel: 306-978-2800
Fax: 306-975-3766
Toll Free: 1-800-230-2751
e-mail: pos@pos.ca

POS Pilot Plant Corporation

Expertise

- Primary level: conditioning, grinding, dry separation and oilseed trituration
- Secondary level: centrifugation, evaporation, dehydration, chemical reactions and other processes
- Oil extraction: ungumming, refining, bleaching, deodorization and crystallization
- Extraction by solvent, hydrogenation and processes by solvent

Technological Infrastructure

- Pilot plant
- Centrifugal partition chromatograph
- Perforated bowl centrifuge of Heinkle inversion
- Ultra filtration apparatus with flexible membrane
- Respect of the good laboratory practices
- Evaporator
- Drying apparatus
- Pasteurisation



University of Saskatchewan

Capsule

The University of Saskatchewan has two programs which are closely related to the FFN sector. One program is on medicinal plants, which aims at carrying out research on medicinal and aromatic plants to determine possible specific cultures and unique ingredient sources for phytomedicinal products and nutraceutical ingredients. The natural health products program aims to develop product analysis and quality control methods.

Location

Program on Medicinal Plants

Phytotechny Department

51 Campus Drive, Saskatoon, Saskatchewan S7N 5A8

Telephone: (306) 966-5868 Web site: <http://www.usask.ca>

Program on Natural Health Products

College of Pharmacy and Nutrition

110 Science Place, Saskatoon, Saskatchewan S7N 5C9

Telephone: (306) 966-5847

Web site: <http://www.usask.ca/pharmacy-nutrition>



University of Saskatchewan

Expertise

- Protocols of analysis for the characterization of active compounds of medicinal plants
- Plant evaluation as sources of antioxydant, antitumor compounds (with the department of pharmacology)
- Sifting of plants for their immuno stimulant activity and anticancerogenic
- Clinical trials (human) in accordance with good clinical practices

Technological Infrastructure

- Characterization
- Clinical trials
- Experimental farm, greenhouses, phytotron
- Plant laboratory
- Sensory evaluation
- Installations for animal testing

University of Alberta

Functional Foods Alberta Centre of Excellence

Capsule

Functional Foods Alberta Centre of Excellence (FFCE) was created to provide a solid and credible scientific base required by the emerging FFN industry. It will also provide data to the legislators who must state fair and foreseeable regulations. Moreover, the centre will help the industry to benefit from the global market opportunity. It will become a significant vehicle of economic diversification and scientific innovation.

- The FFCE will seek bonds between diet and chronic disease. The centre will help create new companies and new markets;
- The centre aims at agriculture and food innovation by the discovery of new products and by the development of market opportunities contributing to the rise of industry;
- The FFCE is “a virtual centre” composed of a team of professionals throughout Alberta.

Location

University of Alberta
Office 410, Agriculture Forestry Centre,
Edmonton, Alberta T6G 2P5
Telephone: (780) 492-0905
Facsimile: (780) 492-8855
Email: gwilkes@afns.ualberta.ca
Web site: <http://www.afns.ualberta.ca>



Olds College Centre for Innovation (OCCI)
4500-50 Street, Olds, Alberta T4H 1R6
Telephone: 1-877-815-OCCI (6224) or
(403) 507-7970 Facsimile: (403) 507-7977
Email: occi@admin.oldscollge.ab.ca
Web site: <http://www.occi.ab.ca>



Department of Agricultural, Food and Nutritional Science

Capsule

At the University of Alberta, the Department of Agricultural, Food and Nutritional Science (DAFNS) activities are orientated toward the food chain and its effects on human health (healthy diet). The Department began with an integrated approach to production, transformation and use of food of agricultural origin. It is involved also in the acquisition of solid competencies in three bound strategic fields, which are: effective and viable production, agri-food technology as well as human health and nutrition.

The Food for Health Program wants to stimulate the economic growth in the province by developing new technologies and foodstuffs resulting from cultures and breeding; to ensure that food provisioning is safe and nutritive; to contribute to the health and well-being of Albertans by a better knowledge of the relations which exist between diet and health in man.

Location

Agriculture/Forestry Centre, Office 410, Edmonton, Alberta T6G 2P5

Telephone: (780) 492-3239

Facsimile: (780) 492-4265

Email: chair@afns.ualberta.ca

Web site: <http://www.ualberta.ca>



Expertise

- Production
- Agri-food technology
- Human health and nutrition

Technological Infrastructure

- Modern analysis installations and related operations
- Research laboratories (biochemistry, microbiology, culture of tissue)
- Capacity for certain pilot tasks on plants
- Molecular biology and biotechnology centre
- Installations for the culture of plants
- Metabolic research unit
- Research unit on dairy animals and poultry
- Research unit on cultures and soils



University of Alberta Food Processing Development Centre

Capsule

The development and research centre has a modern pilot plant and a laboratory for the development of products. The Centre's expertise includes scientists of experience, engineers and technicians in the field of food.

Location

6309 – 45th Street, Leduc, Alberta T9E 7C5

Telephone: (780) 986-4793 Facsimile: (780) 986-5138

Email: stonge@agric.gov.ab.ca Web site: www.agric.gov.ab.ca/ministry/org/fpdc



University of Alberta

Food Processing Development Centre

Expertise

- Development of products and food processes
- Technical information services

Technological Infrastructure

- Freezer, fryer
- Dryer, oven, mixer, separator
- Chromatograph
- Packaging machine
- Fermentation
- Colorimetric
- Digestion/distillation
- Homogenisation
- Filtration
- Meat product transformation



Olds College Centre for Innovation

Capsule

The Centre supports companies in their research, their development and marketing of new products, new processes, and new technologies. The centre also offers an incubation service for new companies.

Location

4500-50th Street, Olds, Alberta T4H 1R6

Telephone: 1-877-815-OCCI (6224) or (403) 507-7970

Facsimile: (403) 507-7977

Email: occi@admin.oldscollege.ab.ca Web site: <http://www.occi.ab.ca>



Olds College Centre for Innovation

Expertise

- Microbiology
- Plant physiology
- Natural fibres

Technological Infrastructure

- Microbiology laboratory, analytical chemistry, plant physiology
- Chromatography, HPLC, lyophilizer, growth chambers
- Homogenisation
- Experimental farms and greenhouses



Food Processing Resource Centre British Columbia Institute of Technology

Capsule

The food technology department of the British Columbia Institute of Technology (BCIT) is available for use by companies, contractors and advisers working in the food industry in British Columbia. The services provided by this new infrastructure include:

- Access to laboratory equipment and pilot installations
- Product development and process services
- Administrative assistance and consultation services

Location

3700 Willingdon Avenue, Burnaby, British Columbia V5G 3H2

Telephone: (604) 432-8320 Facsimile: (604) 434-6986

Email: cliff_dunlop@bcit.ca

Web site: http://www.penr.bcit.ca/foodtech/resource_centre



Food Processing Resource Centre British Columbia Institute of Technology

Expertise

- Food product and process development

Technological Infrastructure

Installation for:

- Cooking, heating and thermal process
- Cooling and water activity
- Dairy product treatment
- Reduction and mixing of foods
- Filtration and separation
- Packaging
- Microbiology



Faculty of Agricultural Sciences University of British Columbia

Capsule

The nutrition and health program of the Faculty of Agricultural Sciences places emphasis on the quality and safety of food in relation to health.

Location

270 - 2357 Main Mall, Vancouver, British Columbia V6T 1Z4

Telephone: (604) 822-2620

Facsimile: (604) 822-4400

Email: agsci@interchange.ubc.ca

Web site: www.agsci.ubc.ca



THE UNIVERSITY OF
BRITISH COLUMBIA

Faculty of Agricultural Sciences University of British Columbia

Expertise

- Food science
- Nutrition science, impact on health, relation between the metabolism and the disease
- Marketing of products
- Interdisciplinary approach covering production, transformation to consumption
- Preservation, packing

Technological Infrastructure

- Characterization
- Analysis of the nutriment
- Biology, physiology and process engineering
- Food transformation pilot unit
- Analysis and research laboratories
- Fermentors and incubators



Universities and Other Research Centres

	Food Technology Centre	Food Research Centre, Université de Moncton	Nova Scotia Agricultural College	Marine Biotechnology Research Centre	Nutraceuticals and Functional Foods Institute	Centre for Human Nutrition, University of Western Ontario	Guelph Centre for Functional Foods	Human Nutraceutical Research Unit	Guelph Food Technology Centre
Location	Charlottetown, Prince Edward Island	Moncton, New Brunswick	Truro, Nova Scotia	Rimouski, Quebec	Quebec, Quebec	London, Ontario	Guelph, Ontario	Guelph, Ontario	Guelph, Ontario
Specialties	food and marine products	marine products, milk products, fruits and vegetables	fruits and vegetables, animal productions	marine biomolecule	milk products, marine biology, fruits and vegetables	cancer and cardiovascular diseases	functional foods, nutraceuticals	new foods, natural health products	food
Genomics, proteomics and bioinformatics					x				
Production and primary processing			x		x		x		
Processing, formulation and food production	x	x	x	x	x		x		x
Extraction, purification and characterization	x	x		x	x		x		x
Nutritional and toxicological studies (clinical assays)					x	x		x	
Bioassay platforms					x	x			
Short serie production for commercialization of functional foods and nutraceuticals					pilot laboratory				pilot plant



Universities and Other Research Centres

	Department of Nutritional Sciences, University of Toronto	National Centre for Agri-Food Research in Medicine, St-Boniface General Hospital Research Centre	Millennium Centre for Food and Nutraceutical Research, University of Manitoba	POS Pilot Plant Corporation	University of Saskatchewan	University of Alberta	Food Processing Development Centre	Olds College Centre for Innovation	Food Processing Resource Centre, British Columbia Institute of Technology	Faculty of Agricultural Sciences, University of British Columbia
Location	Toronto, Ontario	Winnipeg, Manitoba	Winnipeg, Manitoba	Saskatoon, Saskatchewan	Saskatoon, Saskatchewan	Edmonton, Alberta	Leduc, Alberta	Olds, Alberta	Burnaby, British Columbia	Vancouver, British Columbia
Specialties	chronic disease and nutrition	clinical tests	functional foods and nutraceuticals	fractionation, extraction, purification and modification	research program on natural health products	food chain and its effect on human health	meat, transformation process in humid and dry environment	natural fibre, crops	product and process development	health safety, nutrition
Genomics, proteomics and bioinformatics			x					x		
Production and primary processing						x	x	x	x	
Processing, formulation and food production			x	x		x	x	x	x	
Extraction, purification and characterization		x	x	x	x	x	x			x
Nutritional and toxicological studies (clinical assays)	x	x			x	x				x
Bioassay platforms	x	x			x					x
Short serie production for commercialization of functional foods and nutraceuticals			pilot plant	pilot plant			pilot plant			



Universities and Other Research Centres

Summary

1. Universities are the only R&D centres involved in nutrition and clinical research.
2. Interdisciplinary approach from production to consumption
3. Three Canadian leaders:
 - Institut des nutraceutiques et aliments fonctionnels (Quebec and Maritimes);
 - Guelph and Toronto Universities (Ontario);
 - University of Manitoba and the National Centre for Agri-Food Research in Medicine.
4. Leaders of multiple networks:
 - Pro-biotics;
 - Natural health products;
 - Cardiovascular diseases.

Regional Distribution of R&D Centres on Functional Foods and Nutraceuticals in Canada

Maritimes	Food Technology Centre	Food Research Centre, Université de Moncton	Nova Scotia Agricultural College	Institute for Marine Biosciences	Atlantic Food and Horticulture Research Centre
Location	Charlottetown, Prince Edward Island	Moncton, New Brunswick	Truro, Nova Scotia	Halifax, Nova Scotia	Kentville, Nova Scotia
Specialties	food and marine products	marine products, milk products, fruits and vegetables	fruits and vegetables, animal productions	marine biology	fruits and vegetables
Genomics, proteomics and bioinformatics				X	
Production and primary processing			X	X	X
Processing, formulation and food production	X	X	X	X	X
Extraction, purification and characterization	X	X		X	X
Nutritional and toxicological studies (clinical assays)					
Bioassay platforms					
Short serie production for commercialization of functional foods and nutraceuticals					



Regional Distribution of R&D Centres on Functional Foods and Nutraceuticals in Canada

Quebec	Marine Biotechnology Research Centre	Nutraceuticals and Functional Foods Institute	Food Research and Development Centre	Horticultural Research and Development Centre
Location	Rimouski, Quebec	Quebec, Quebec	St Hyacinthe, Quebec	St Jean sur Richelieu, Quebec
Specialties	marine biomolecule	milk products, marine biology, fruits and vegetables	milk products, meat products, fruits and vegetables	fruits and vegetables
Genomics, proteomics and bioinformatics		X		X
Production and primary processing		X		X
Processing, formulation and food production	X	X	X	
Extraction, purification and characterization	X	X	X	
Nutritional and toxicological studies (clinical assays)		X		
Bioassay platforms		X		
Short serie production for commercialization of functional foods and nutraceuticals		pilot laboratory	pilot plant	



Regional Distribution of R&D Centres on Functional Foods and Nutraceuticals in Canada

Ontario	Institute for National Measurement Standards	Institute for Chemical Process and Environment Technology	Eastern Cereal & Oilseed Research Centre	Department of Nutritional Sciences, University of Toronto	Guelph Centre for Functional Foods	Human Nutraceutical Research Unit
Location	Ottawa, Ontario	Ottawa, Ontario	Ottawa, Ontario	Toronto, Ontario	Guelph, Ontario	Guelph, Ontario
Specialties	metrology, analytical chemistry	process technologies, food and natural products	cereals, oleaginous	chronic disease and nutrition	functional foods and nutraceuticals	new foods, natural health products
Genomics, proteomics and bioinformatics	X		X			
Production and primary processing			X		X	
Processing, formulation and food production					X	
Extraction, purification and characterization	X	X	X		X	
Nutritional and toxicological studies (clinical assays)				X		X
Bioassay platforms				X		
Short serie production for commercialization of functional foods and nutraceuticals		pilot plant				



Regional Distribution of R&D Centres on Functional Foods and Nutraceuticals in Canada

Ontario	Guelph Food Technology Centre	Southern Crop Protection and Food Research Centre		Centre for Human Nutrition, University of Western Ontario	Greenhouse and Processing Crops Research Centre
Location	Guelph, Ontario	Guelph, Delhi	London, Vineland	London, Ontario	Harrow, Ontario
Specialties	food	fruits and vegetables, cereals	medicinal plants	cancer and cardiovascular diseases	vegetables, soya
Genomics, proteomics and bioinformatics		X			X
Production and primary processing		X			X
Processing, formulation and food production	X	X			
Extraction, purification and characterization	X		X		X
Nutritional and toxicological studies (clinical assays)				X	
Bioassay platforms				X	
Short serie production for commercialization of functional foods and nutraceuticals	pilot plant				



Regional Distribution of R&D Centres on Functional Foods and Nutraceuticals in Canada

Western Provinces	National Centre for Agri-Food Research in Medicine, St Boniface General Hospital Research Centre	Millennium Centre for Functional Food and Nutraceutical Research, University of Manitoba	POS Pilot Plant Corporation	University of Saskatchewan	Saskatoon Research Centre	Plant Biotechnology Institute*	University of Alberta	Food Processing Development Centre
Location	Winnipeg, Manitoba	Winnipeg, Manitoba	Saskatoon, Saskatchewan	Saskatoon, Saskatchewan	Saskatoon, Saskatchewan	Saskatoon, Saskatchewan	Edmonton, Alberta	Leduc, Alberta
Specialties	clinical tests	functional foods and nutraceuticals	fractionation, extraction, purification and modification	research program on natural health products	field crops	plants and crops	food chain and its effects on human health	meat, transformation process in humid and dry environment
Genomics, proteomics and bioinformatics					X	X		
Production and primary processing					X	X	X	X
Processing, formulation and food production		X	X				X	X
Extraction, purification and characterization	X	X	X	X	X	X	X	X
Nutritional and toxicological studies (clinical assays)	X			X			X	
Bioassay platforms	X			X				
Short serie production for commercialization of functional foods and nutraceuticals		pilot plant	pilot plant					pilot plant

* Responsible for the research network on functional foods and nutraceuticals in Canada.

Regional Distribution of R&D Centres on Functional Foods and Nutraceuticals in Canada

Western Provinces	Olds College Centre for Innovation	Lacombe Research Centre	Lethbridge Research Centre	Pacific Agri-Food Research Centre	Food Processing Resource Centre, British Columbia Institute of Technology	Faculty of Agricultural Sciences, University of British Columbia
Location	Olds, Alberta	Lacombe, Alberta	Lethbridge, Alberta	Summerland, British Columbia	Burnaby, British Columbia	Vancouver, British Columbia
Specialties	natural fibre, crops	meat products	beef, cereals	fruits and vegetables, medicinal plants	product and process development	health safety, nutrition
Genomics, proteomics and bioinformatics	X	X	X	X		
Production and primary processing	X	X	X	X	X	
Processing, formulation and food production	X			X	X	
Extraction, purification and characterization		X	X	X		X
Nutritional and toxicological studies (clinical assays)						X
Bioassay platforms						X
Short serie production for commercialization of functional foods and nutraceuticals						



Research Networks Related to Functional Foods and Nutraceuticals



Networks in Canada

1. Networks on bioproducts and food safety with Agriculture and Agri-Food Canada.
2. Network of the Nutraceuticals and Functional Foods Institute (Quebec and Maritimes).
3. Network on pro-biotics.
4. Network on natural health products.
5. Network on cardiovascular diseases.
6. NRC technological cluster (PBI).
7. Ontario network of functional foods and nutraceuticals.
8. Network on marine biomass utilization.

1. Bioproducts and Food Safety Network of Agriculture and Agri-Food Canada

Capsule

AAFC gave itself in 2001 new directions highlighted in four national programs:

- Environmental health
- Sustainable production systems
- Bioproducts and processes
- Food safety and quality

Two of these programs are more specifically aimed at FFN:

Bioproducts and processes

- Specialty biobased products and processes (nutraceuticals, pharmaceuticals, etc.)
- Bioenergy and biomass products and processes (biofuels, structural materials, etc.)
- Bioinformation (bioinformatics, genomics, platform technologies, etc.), food safety and quality
- Improved and new products (fresh and processed) and improved and new processes
- Knowledge and tools in support of food safety and regulations
- Quality to meet consumer preferences and nutritional needs



2. Nutraceutical and Functional Foods Institute Network

Capsule

In 1999, the Nutraceutical and Functional Foods Institute created a network whose vocation is summarized with the following two essential elements:

1. To contribute to the improvement of public health by a better knowledge of the nutritive and preventive properties of a vast range of molecules or ingredients found in food including dairy products, fruits and vegetables, cereals, etc.
2. To contribute to the training of experts in this field, which is in full expansion, on an international scale.

This network is the most significant grouping of researchers whose work is devoted to the relation between food and health. The fields of expertise are agronomy, food sciences, nutrition, pharmacy, medicine, genomics and economy.



2. Nutraceutical and Functional Foods Institute Network

Network Members

This research centre will gather about fifty researchers who come from:

- Université Laval, three faculties (agricultural and food sciences, medicine and pharmacy)
- Université du Québec in Montréal
- Université du Québec in Chicoutimi
- Université du Québec in Trois-Rivières
- Agriculture and agri-Food Canada
- Centre collégial de transfert en biotechnologies du cégep Lévis-Lauzon (TransBioTech)
- McGill University
- Université de Montréal
- Université de Moncton
- Institut Armand-Frappier

Four chairs in Canada are related to the programming of the Nutraceutical and Functional Foods Institute:

- Chair Lacroix in lacteous bacteria
- Chair Subirade in encapsulation
- Chair Lamarche in nutrition
- Chair Tremblay in nutrition

One chair in genomics (Sirard) is also complimentary to certain work of the Institute.



3. Pro-Biotic Network

Capsule

A new and unique Canadian research network joins together Canadian pro-biotic researchers. The three objectives of this network are:

1. To develop the fundamental and applied knowledge to lactic bacteria metabolic activities having significant effects on health, and improving harmlessness of food.
2. To validate, on some health targets, the effects of selected bacterial sources and characterized for their metabolic activities by using various *in vitro* and *in vivo* models.
3. To develop adequate technologies for the production of fermented dairy products, functional foods containing pro-biotics in order to exploit the positive effects at the intestinal level.

To conclude its objectives, the research program will be built around five topics:

1. Sugar metabolism.
2. Protein metabolism.
3. Lipid metabolism.
4. Proprieties and interaction of the cellular walls.
5. Models *in vitro* et *in vivo*.

Funding of 10 million dollars has been requested of the Natural Sciences and Engineering Research Council of Canada (NSERC).



3. Pro-Biotic Network

Network Members

- Allison, Gwen: University of Alberta
- Audet, Pascal: Université de Moncton
- Boutin, Yvan: Collège Lévis-Lauzon
- Champagne, Claude: Centre de R&D sur les aliments
- Cousineau, Benoît: McGill University
- Farnworth, Edward: Centre de R&D sur les aliments
- Fliss, Ismaïl: Université Laval
- Green-Johnson, Julia: Acadia University
- Griffiths, Mansel: Guelph University
- Holley, Richard A.: University of Manitoba
- Jelen, Pavel: University of Alberta
- Lacroix, Christophe: Université Laval
- Lamarche, Benoît: Université Laval
- Lapointe, Gisèle: Université Laval
- Matar, Chantal: Université de Moncton
- Moineau, Sylvain: Université Laval
- Paré, Pierre: Université Laval
- Reid, Gregor: University of Western Ontario
- St-Gelais, Daniel: Centre de R&D sur les aliments
- Subirade, Muriel: Université Laval
- Tannock, Gérald: University of Otago and University of Alberta



4. Natural Health Products Network

Capsule

A Canadian network of research on natural health products is currently in the creation process. The axes under study are:

- Product quality
- Research/education capacity
- Native health
- Aging
- Body and health development
- Men's health versus women's health

In addition, there is a technological network on natural health products from Ontario. The network members come from research and industry. The set aim is the growth of the industry by various strategies, which touches research, product quality, marketing and integrating the market.

Funding request to the Networks of Centers of Excellence (NCE, 2003).

4. Natural Health Products Network

Members of this Canadian Network:

- Arnason, John: University of Ottawa
- Assinewe, Valerie
- Bombardier, Claire: University of Toronto
- Boon, Heather: University of Toronto
- Bradwejn: University of Ottawa
- Cane, Roy
- Carpentier, Richard
- Chang, Tom
- Dooling, Kathleen: University of Newfoundland
- Eurgics, Janice
- Grant, Michael
- Gunns, Emma
- Haddad, Pierre: Université de Montréal
- Harrison, Christine
- Hoffer, John: McGill University
- Hudson, Jim
- Johns, Tim
- Katz, Sid: University of British Columbia
- Kelner, Merrijoy: University of Toronto
- LaMere, Erma
- Lee, Tim: Dalhousie University
- Leis, Anne: University of Saskatchewan
- Marles, Robin: Brandon University
- Mazza, Joe
- McCutcheon, Allison: University of British Columbia
- Mior, Sil: Canadian Memorial Chiropractic College (Toronto)
- Moher, David: Thomas C. Calmers Centre for Systematic Reviews (Ottawa)
- O'Hara, Dennis: University of Toronto
- Pierce, Grant: University of Manitoba
- Quon, Jeff: University of British Columbia
- Reider, Michael
- Ributz, Bob
- Shan, Jackie: University of Alberta
- Smith, Michael: Health Canada (Ottawa)
- Turner, Nancy
- Verhoef, Marja: University of Calgary
- Vohra, Sunita: University of Toronto
- Vuksan, Vladimir
- Welsh, Sandy
- Yada, Rick



5. Cardiovascular Disease Network

Capsule

The research carried out on this network is based on the effects of the combination of dietetic factors (fibres, proteins of vegetable origin and phytosterols), on cholesterol reduction for hyperlipidemic subjects. This research will be done by clinical trials on patients.

Network Members

- *Quebec, Quebec*: Nutraceuticals and Functional Foods Institute and the Centre de recherche sur les lipides, Centre de recherche du CHUL, Université Laval
- *Montreal, Quebec*: Mary Emily Clinical Nutrition Research Unit, Campus MacDonald of McGill University
- *Toronto, Ontario*: Clinical Nutrition and Risk Factor Modification Centre, J. Alick Little Research Laboratory, St. Michael's Hospital, departments of nutritional sciences, pharmacology and psychology, Faculty of Medicine, Drug-Addiction and Mental Health Centre, University de Toronto
- *Vancouver, British Columbia*: Healthy Heart Program, St. Paul's Hospital

Funding request of 0.8 million dollars from the Canadian Health Research Institutes.



6. National Research Council of Canada Technology Cluster

The Government of Canada granted **10 million dollars (5 years)** to the National Research Council to set up, under the direction of the Plant Biotechnology Institute (PBI), a technology cluster on FFN in the Western provinces.

The technology cluster will make it possible to reinforce Saskatoon's PBI's available resources in genomics and bio data-processing and link network parties from the Western provinces.



7. Ontario's Network on Functional Foods and Nutraceuticals

Guelph and Toronto universities have submitted a research and development project to the Ontario government, which would link by a network the various parties of this sector.



8. Valorization Network of Marine Biomass

Since marine biomass constitutes a significant source of raw material for FFN, it would be useful and relevant to create a network on this subject which could link together:

- Nutraceutical and Functional Foods Institute, Quebec
- Marine Biotechnology Research Centre, Rimouski
- POS Pilot Plant Corporation (POS), Saskatoon
- National Research Council (NRC), Halifax
- Nova Scotia College of Agriculture (NSCA), Truro
- Technology Cluster, Prince Edward Island
- Others



Canadian Technological Roadmap on Functional Foods and Nutraceuticals

Section 6

Canadian Funding for the FFN Sector

September 2002



Funding for the FFN Sector

- Financial assistance for the Canadian FFN industry appears mainly in two forms:
 - Contribution done to companies, generally not specific to the FFN sector
 - Financial support to research infrastructure
- Recently, significant investments were done in research with little coordination for an integrated industry approach
- According to our census, in addition to the programs addressed to all companies, there exists practically no specific programs for FFN companies in terms of financial assistance
- The Canadian regulatory framework will impose new standards in manufacturing control (GMP/GLP) and scientific evidence. This will have a significant impact on small companies and on their ability to adapt to this new environment



Company Funding

FFN Company Assistance

- Until now, there exists very little direct support specific to companies from the FFN Canadian sector. For example, a recent initiative dedicated to the sector was announced: a provincial tax credit (for companies of the Quebec metropolitan area) of 40% on the wages of new employees in marketing and manufacturing¹
- The commonly used programs by FFN companies are:
 - Tax credits (Federal and Provincial) associated to scientific research and experimental development
 - *IRAP Industrial Technology Advisor (IRAP) of the National Research Council*
 - Financial assistance in research and development
 - Contribution to the precommercialisation
 - Programs for young trainees
 - Assistance programs to exports (*Canada Economic Development, Export Development Canada, Agri-Food Trade Service, etc.*)
 - *Canadian Adaptation and Rural Development (CARD)² (Agriculture and Agri-Food Canada):*
 - Cost sharing program for investment in R&D
 - *Canada Food Safety Adaptation Program (CFSAP)*

1. Refer to the “Budget du Québec”, Février 2002 (Quebec Budget, February 2002).
2. Refer to Appendix A for each province and territory adaptation councils.

Research Funding

Canada Foundation for Innovation (CFI)

Canadian Institutes of Health Research (CIHR)

Regrouping members (interested in FFN):

- *Institute of Aging*
- *Institute of Cancer Research*
- *Institute of Circulatory and Respiratory Health*
- *Institute of Gender and Health*
- *Institute of Genetics*
- *Institute of Human Development, Child and Youth Health*
- *Institute of Infection and Immunity*
- *Institute of Musculoskeletal Health and Arthritis*
- *Institute of Neurosciences, Mental Health and Addiction*
- *Institute of Nutrition, Metabolism and Diabetes*



Research Funding

Genome Canada

*Natural Sciences and Engineering Research Council of
Canada (NSERC)*

- Including the *Network of Centres of Excellence (NCE)*

Technology Partnership Canada (TPC)



Canada Foundation for Innovation (CFI)

Mandate

Independent corporation established by the Government of Canada in 1997, with a goal to strengthen the capability of Canadian universities, colleges, research hospitals, and other not-for-profit institutions, to carry out world-class research and technology development.

General

- Various available funds:
 - Canada Research Chairs Infrastructure Fund
 - International Funds
 - Innovation Fund
- These funds make it possible to play a more active role in the knowledge economy by way of *Excellence Research Centers* at a worldwide level

Projects Related to Genomics

- Address Canada's needs for the application of genomics
- Centralize the provision of core facilities within institutions or regions
- Link bioinformatic efforts with other Canadian bioinformatic centers
- Develop innovative approaches to new genomic-related technology or expanding the range of applications of existing technologies

Canadian Institutes of Health Research (CIHR)

Mandate

Promote the creation of new knowledge and its translation into improved health for Canadians, more effective health services and products, and a strengthened Canadian health care system.

Funding Available

- Genome scientific research program
- Research programs:
 - Operating grants
 - Various other types of available grants:
 - Equipment purchases
 - Maintenance
 - Multi-user or research group



Canadian Institutes of Health Research (CIHR)

- Research Personnel Programs:
 - Training award and salary support programs:
 - Research Training Award Programs
 - Studentships
 - Doctoral Research Awards and MD/PhD Studentships
 - Fellowships
 - Senior Research Fellowships
 - Research Salary Support Programs:
 - New investigators
 - Investigators
 - Senior and Distinguished Investigators
 - Distinguished Scientists



Canadian Institutes of Health Research (CIHR)

- Industry - Partnered Program:
 - Industry - Partnered Training Programs:
 - Industry - Partnered Studentship
 - Industry - Partnered MD/PhD Studentship
 - Industry - Partnered Fellowships
 - Industry - Partnered Operating Fellowships
 - Industry - Partnered Clinician-Scientists
 - Industry - Partnered Salary Support:
 - Industry - Partnered New Investigators
 - Industry - Partnered Investigators
 - Industry - Partnered Senior Investigators
 - University - Industry Research Chairs
 - Industry - Partnered Research Grants:
 - Industry - Partnered Operating Grants
 - Industry - Partnered Equipment Grants and Multi-user Equipment Grants
 - Industry - Partnered Maintenance Grants and Multi-user Maintenance Grants
 - Industry - Partnered Group Grants
 - Industry - Partnered Randomized Controlled Trials, Workshops and Symposia

Canadian Institutes of Health Research (CIHR) Institute of Aging (IA)

Mandate

Support research that promotes healthy aging and addresses causes, prevention, screening, treatment, support systems and palliation for a wide range of conditions associated with aging.

Funding Available

- New Emerging Team Grant Program
- Strategic Training Initiative in Health Research
- Reducing Health Disparities and Promoting the Health of Vulnerable Populations
- Pilot Projects
- Protocol Design for the Canadian Longitudinal Study on Aging
- Application for Workshop Support
- Support the next generation of Health Researchers



Canadian Institutes of Health Research (CIHR) Institute of Cancer Research (ICR)

Mandate

Foster research based on internationally accepted standards of scientific excellence, which bear on preventing and treating cancer, and improving the health and quality of life of cancer patients.

Funding Available

- Needs, Gaps and Opportunities Assessments Grants in Priority Research Area
- Financing Health Care in the face of Changing Public Expectations
- Support the next generation of Health Researchers



Canadian Institutes of Health Research (CIHR) Institute of Circulatory and Respiratory Health (ICRH)

Mandate

Support research into causes, prevention, screening, diagnosis, treatment, support systems and palliation for a wide range of conditions associated with the heart, lungs, brain (stroke), blood, blood vessels, clinical care and sleep.

Funding Available

- Support the next generation of Health Researchers
- Strategic Initiative in Health Research Training
- Gene–Environment Interactions in Circulatory & Respiratory Diseases
- New Emerging Team Grant Program
- New Initiatives in Heart and Stroke Research in 2001
- New Frontiers Program



Canadian Institutes of Health Research (CIHR)

Institute of Gender and Health (IGH)

Mandate

Support research to address how sex and gender interact with other factors that influence health.

Funding Available

- New Emerging Team Grant Program
- Understanding and addressing the Impacts of Physical and Social Environments on Health
- Translation Acceleration Grants Program for Breast Cancer Control
- Strategic Training Initiative in Health Research
- Reducing Health Disparities and Promoting the Health of Vulnerable Populations
- Global Health Research Program Development and Planning Grants
- New Perspectives on Gender and Health
- Improving Access to Appropriate Health Services for Marginalized Groups



Canadian Institutes of Health Research (CIHR) Institute of Genetics (IG)

Mandate

Support excellent research on the genetic and biochemical basis of health and disease, including the interaction of genes with the physical and social environments, to facilitate the translation of research findings into health policy and practice, and to examine the ethical, legal and social implications of genetic discoveries.

Funding Available

- Celera Genome Database Grant
- Clinical Investigatorship Award
- Jessie Boyd & Charles Scriver MD/PhD Studentship Award
- Short-term Exchange Grants



Canadian Institutes of Health Research (CIHR) *Institute of Human Development, Child and Youth Health* *(IHDCYH)*

Mandate

Support research to enhance maternal, child and youth health and to address causes, prevention, screening, diagnosis, treatment, short and long term support systems and palliation for a wide range of health concerns associated with reproduction, early development, childhood and adolescence.

Funding Available

- New Emerging Team Grant Program
- Strategic Initiative on Healthy Gametes and Great Embryos
- Strategic Training Initiative in Health Research
- Support the next generation of Health Researchers



Canadian Institutes of Health Research (CIHR)

Institute of Infection and Immunity (III)

Mandate

Establish national leadership, priorities and programs that promote innovative research to reduce the global burden of infection and immune-based disease and improve quality of life.

Funding Available

- Strategic Training Initiative in Health Research
- New Emerging Team Grant Program
- Needs, Gaps, Opportunities Assessment Grant
- Clinician Scientists in Infectious Diseases
- Global Health Research Program Development and Planning Grants
- Reducing Health Disparities and Promoting the Health of Vulnerable Populations
- HIV – AIDS



Canadian Institutes of Health Research (CIHR)

Institute of Musculoskeletal Health and Arthritis (IMHA)

Mandate

Support research and address causes, prevention, screening, diagnosis, treatment, support systems and palliation for a wide range of conditions related to bones, joints, muscles, connective tissues, skin and teeth.

Funding Available

- Strategic Training Initiative in Health Research
- Health Professionals undertaking research – Post Doctoral Awards
- Invention - Tools, Techniques and Devices for Research and Medicine
- New discoveries
- Interdisciplinary Capacity Enhancement Teams Grant (ICE)
- New frontiers program: work out a national research program in the field of the circulatory and respiratory equipment
- Knowledge Translation Strategies for Health Research
- Grants for foreign or expatriated researchers recruitment in the field of circulatory and respiratory equipment
- Operating Grants
- Support the next generation of Health Researchers

Canadian Institutes of Health Research (CIHR) Institute of Neurosciences, Mental Health and Addiction (INMHA)

Mandate

Support research to enhance mental health, neurological health, vision, hearing, and cognitive functioning. Reduce the burden of related disorders through prevention strategies, screening, diagnosis, treatment, support systems, and palliation.

Funding Available

- New Emerging Team (NET) Grant Program
- Strategic Training Initiative in Health Research
- Reducing Health Disparities and Promoting the Health of Vulnerable Populations
- Global Health Research Program Development and Planning Grants
- Knowledge Translation Strategies for Health Research
- Michael Smith Chair in Neuroscience and Mental Health
- Research on Knowledge Translation
- Support the next generation of Health Researchers

Canadian Institutes of Health Research (CIHR) Institute of Nutrition, Metabolism and Diabetes (INMD)

Mandate

Support research to enhance health in relation to diet, digestion, excretion and metabolism. Address causes, prevention, screening, diagnosis, treatment, support systems and palliation for a wide range of conditions and problems associated with hormone, digestive system, kidney and liver function.

Funding Available

- Excellence, Innovation and Advancement in the Study of Obesity and Healthy Body Weight
- Global Health Research Program Development and Planning Grants
- Study on Diabetes
- Diabetes Surveillance System (NDSS) Grant

Genome Canada

Mandate

Funding for a number of large-scale genomic projects and associated science and technology platforms. Increase the competence of Canada with regard to the human genome.

General

- Principal source of funding and information related to genomics in Canada
- Until now, two contests were offered to various intervening parties



Natural Sciences and Engineering Research Council of Canada (NSERC)

Mandate

*Promote and support research in natural sciences and engineering,
other than health sciences.*

Funding Available

- Collaborative Health Research Projects
- Strategic Project Grants
- Discovery Grants
- Genomic Projects



Network of Centres of Excellence (NCE)

Mandate

Foster powerful partnerships between university, government and industry, develop Canada's economy and improve the quality of life of Canadians.

General

- Three Canadian Federal Granting Agencies – The *Canadian Institutes of Health Research (CIHR)*, the *Natural Sciences and Engineering Research Council of Canada (NSERC)* and the *Social Sciences and Humanities Research Council of Canada (SSHRC)* – and *Industry Canada* combine their efforts to support and oversee the NCE initiative
- Current administration is ensured by the management of the NCE
- A contest is currently organized:
 - The successful new Networks will begin operations in the fall of 2003
 - Approximately CA \$12 million will be available
 - Invitation to all research areas to submit letters of intent (requests)

Technology Partnership Canada (TPC)

Mandate

TPC is an agency of Industry Canada, which supports research, development and innovation.

General

- As at December 31, 2001, TPC carried out 143 investments for CA \$1.7 billion
- Encourage private sector investment, maintenance and growth of the technology base and technological capabilities of the Canadian industry
- Support in various field:
 - Environmental technologies
 - Enabling technologies (including the applications of biotechnology)
 - Aerospace and Defence



Appendix A

List of Provincial and Territorial Adaptation Councils:

Newfoundland and Labrador:	Agri-Adapt Council Inc.
Prince Edward Island:	PEI ADAPT Council
New Brunswick:	New Brunswick Agriculture
Nova Scotia:	Agri-Future Nova Scotia
Quebec:	Conseil pour le développement de l'agriculture du Québec (CDAQ) or Fonds québécois d'adaptation des entreprises agroalimentaires inc. (FQAEA)
Ontario:	Agricultural Adaptation Council
Manitoba:	Manitoba Rural Adaptation Council
Saskatchewan:	CARDS Committee of the Saskatchewan Council for Community Development
Alberta:	Agriculture and Food Council
British Columbia:	B.C. Investment Agriculture Foundation
Nunavut:	Nunavut Harvesters' Association
Northwest Territories:	Territorial CARD Committee
Yukon:	Yukon Agricultural Association