

**BUREAU OF CHEMICAL SAFETY**

**FOOD DIRECTORATE**

**HEALTH PRODUCTS AND FOOD BRANCH**

**HEALTH CANADA**

**REPORT ON ACTIVITIES**  
**2001-2002**

**July 23, 2003**

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## MESSAGE FROM THE DIRECTOR

The last two years have been very busy and active for the Bureau Chemical Safety. The Bureau has had an opportunity to provide advice on many food safety issues to a variety of clients and respond to emerging scientific and regulatory concerns. We have approached our work in an enthusiastic manner—always linked to our strong commitment to fulfill our regulatory responsibilities. This has been a challenge considering that the regulatory environment has become more complex in recent years, and that there is an ever-increasing demand from consumers and stakeholders to be informed about the work we do towards ensuring a safe food supply. We are faced with the challenge of how best to communicate advice to the public in a timely fashion. Some of this has been accomplished through networking and collaboration with other regulatory groups. But, very importantly, posting information on the Health Canada website is becoming increasingly significant. It provides us with a direct means to relay our messages to the consumer. This past year has seen a substantial increase in web-based inquiries to which we have responded.

Activities have been carried out in the major areas of food chemicals and novel foods. The strong Bureau performance is reflected in a substantial number of scientific publications, conference presentations, workshop participation as well as participation in national and international regulatory activities. Some of our work received special recognition at the Food Directorate Awards Ceremony on December 13, 2002. Throughout the last two years, the Bureau welcomed a number of visiting researchers—visiting fellows, postdoctoral students, co-op students—who provided an additional stimulus by participating in a number of our research activities.

This Report on Activities 2001-2002 presents a summary of our research and risk assessment activities in support of regulatory and policy development aimed at ensuring and improving the chemical safety of our food supply.

I would like to express my sincere thanks to our staff for their commitment and enthusiasm in achieving the Bureau's goals. My thanks are also extended to Dr. Karen Dodds, Director General of the Food Directorate, for her support of the Bureau's activities. Special appreciation goes to Barbara Rotter, Man Sen Yong and Frank Lancaster for their time and effort in preparing this report.

Jim Lawrence, Ph.D.  
Director

## 1. INTRODUCTION

Health Canada plays a leading role in helping Canadians maintain and enhance their physical and mental well-being. Its activities help people to increase control over and to improve their own health.

Within that overall context, the mandate of the Bureau of Chemical Safety (BCS), as part of the Food Directorate (FD), Health Products and Food Branch (HPFB) at Health Canada (HC), and under the authority of the *Food and Drugs Act* and Regulations (FDARs), ensures that dietary exposure to toxic chemicals in food is kept within acceptable levels and does not cause harmful effects to the health of Canadians.

BCS has the responsibility for policy, standard setting, risk assessment, research and pre-market evaluation of food chemicals in Canada. The primary objective of the work is to ensure that chemicals are not present in foods at levels that would pose an unacceptable health risk to Canadians and that novel foods are safe. Food chemicals of concern include food additives, food packaging materials, incidental additives, food allergens, food contaminants, natural toxicants and chemicals in novel foods.

### **MISSION**

The mission of the Bureau of Chemical Safety is to protect and improve the health of Canadians by assessing and managing the risks and benefits to health associated with chemicals in the food supply.

The BCS team is composed of highly motivated professional and technical staff working in the areas of chemistry, toxicology, biology, risk assessment methodology and risk management. The team's goal is to effectively respond to regulatory, policy and consumer concerns, and emerging food issues in a timely fashion. The complexities of the current regulatory environment, and the increased demand from the consumer to be informed about risks, present unique challenges to BCS in the areas of risk management and communication.

The task of BCS is accomplished by the application of appropriate risk assessment, risk management and risk communication principles and practice, which is supported by laboratory research activities within BCS and HPFB Food Laboratory operations in four different regions of Canada.

BCS also collaborates horizontally by carrying out monitoring and research activities for food contaminants, agricultural chemicals, veterinary drugs and nutrients in liaison with

the Safe Environments Programme, Healthy Environment and Consumer Safety Branch (HECSB) of HC, the Pest Management Regulatory Agency (PMRA) of HC, the Veterinary Drugs Directorate (VDD) of HPFB and the Bureau of Nutritional Sciences of FD, respectively.

This activity report describes and summarizes the main achievements of the BCS in 2001-2002. More detailed information can be found in the published papers listed in this report. Additional information about Food Program activities is available on the HC website ([http://www.hc-sc.gc.ca/food-aliment/dg/e\\_about\\_us.html](http://www.hc-sc.gc.ca/food-aliment/dg/e_about_us.html)).

## **2. MAIN ACTIVITY AREAS**

### **Assessment and Management of Risk of Chemicals in Food**

BCS is composed of three divisions: Chemical Health Hazard Assessment, Food Research and Toxicology Research.

The Chemical Health Hazard Assessment Division (CHHAD) is responsible for establishing regulatory and non-regulatory measures, as required, to ensure the chemical safety of the food supply in Canada. The major activities of CHHAD include the evaluation of submissions on food additives, novel foods, food packaging materials, incidental additives, the food irradiation process, etc., as part of pre-market evaluation programs. CHHAD also conducts health risk assessments and safety evaluations of chemical contaminants, food allergens and natural toxicants in foods. These activities are conducted in collaboration with the Food Research Division (FRD) and the Toxicology Research Division (TRD) of the Bureau, as well as the Canadian Food Inspection Agency (CFIA) and other Departments and Agencies as necessary.

FRD engages in a range of research activities related to the identification, determination, distribution and sources of potentially hazardous chemicals in the food supply. Major activities are the development of methods of analyses for such chemicals, the conduct of targeted surveys to determine the levels and extent of contamination of food, and National Surveys to determine human exposure to these chemicals. These National Surveys include the Total Diet Study, the Human Breast Milk Survey and the Blood Surveys. The FRD program is conducted in close collaboration with CHHAD, TRD, HPFB Regional Food Laboratories and CFIA.

TRD is responsible for the identification and investigation of potential health hazards associated with novel foods, food-borne chemical contaminants, including those of environmental origin, chemicals used for agriculture and natural food toxicants. Research is carried out to characterize the organ- and disease-specific effects of these substances. The focus of the research is on filling gaps in the knowledge of the toxicity of these

chemicals, particularly as they relate to the health of Canadians and the safety of the Canadian food supply. The resulting data are provided to CHHAD to assist in its risk assessment activities. The other major activities that TRD scientists are engaged in include the refinement of classical toxicological methods and the application of molecular toxicology, molecular pathology, genomics and proteomics as tools to develop and identify sensitive and early biomarkers of genotoxicity, mutagenicity, cancer, endocrine disruption, neurotoxicity and immune dysfunction. These are carried out to facilitate enhanced health risk assessment of food-borne chemicals and novel foods. The Pathology Section of TRD also provides pathology support to scientists in other research divisions of HPFB and HECSB.

### **Program Cooperation and Harmonization**

In cooperation with other federal departments, the territorial governments, five northern Aboriginal organizations and the Centre for Indigenous Peoples' Nutrition and Environment, BCS participates in the Arctic Environmental Strategy and the Northern Contaminants Program to conduct risk-benefit assessments and monitoring studies of contaminants—for example, organochlorines and trace metals in northern traditional or country foods, such as indigenous fish and marine and terrestrial mammals that are not sold commercially and hence are not covered under the FDARs.

In cooperation with PMRA and CFIA, BCS advises all levels of government and the general public concerning the safety of food chemicals in Canada. Under the North American Free Trade Agreement, BCS is actively participating in the technical working groups to harmonize various aspects of procedures and standards for the safety evaluation and dietary exposure assessment of food chemicals. Internationally, consultations also occur at the meetings of the Codex Committee on Food Additives and Contaminants, the Codex Committee on Methods of Analysis and Sampling, the Joint FAO/WHO Expert Committee on Food Additives (JECFA), the Organization for Economic Development and Cooperation (OECD), and the International Life Sciences Institute. In addition, BCS is working in close cooperation with the US Food and Drug Administration (FDA) and the US Environmental Protection Agency on the development and refinement of tools for allergenicity and toxicological assessment of novel foods. BCS also works closely with the Association of Official Analytical Chemists (AOAC) on the validation of analytical methods for food control and laboratory proficiency testing, with the Committee on Food Chemicals Codex to develop specifications for food additives and with OECD on the validation of new toxicological testing guidelines for chemicals.

## **3. ACCOMPLISHMENTS IN BRIEF**

The following presents highlights of recent BCS achievements in the areas of novel foods, food additives, food allergens, food irradiation, food packaging and incidental additives,

food contaminants, veterinary drugs, emergency preparedness and acrylamide in food.

## **Novel Foods**

CHHAD completed pre-market evaluation of five novel food submissions and participated in the development of guidelines for assessment of novel foods. TRD, in partnership with HPFB western regional laboratory, McGill University, University of Manitoba, Department of Fisheries and Ocean and CFIA, has initiated projects, which were funded by the Genomics Initiative, to assess long-term toxicological and health effects of soy products and transgenic fish in animal models. The identification of molecular biomarkers for genetically modified (GM) foods by genomics and proteomics technologies, including the DNA/oligonucleotide micro-array methods, are being developed by TRD. Scientists from TRD and CHHAD have participated in a number of international conferences and workshops and provided expert advice concerning the development and refinement of tools for the toxicological assessment of GM foods.

## **Food Additives**

The Food Additives and Contaminants Section completed approximately 380 food additive submissions the majority of which were food additive advisory opinions. It handled approximately 1,500 general inquiries on food additives, flavours and processing aids, and approximately 660 requests associated with food contaminants, including health risk assessments on contaminant data packages. Work has continued on the Food Additive Regulatory Review Supplementation Initiative, and a contract was completed regarding new ways that enzymes might be evaluated and be regulated. Major items that highlighted sectional activities included food irradiation, acrylamide, morpholine (in apple coatings), formaldehyde (in shiitake mushrooms), meat carcass treatments and mercury in fish. Staff members have participated in committees dealing with Precautionary (Warning) Labels, Food Irradiation Policy, Hemp Science and Policy, Nutrition and Consumption Surveys, Bovine Spongiform Encephalopathy, Food Safety Assessment (Audits). Website information and materials have been prepared on aspartame, 3-MCPD, polyols and food irradiation. Section staff were featured in media interviews on acrylamide, food irradiation and morpholine.

## **Food Allergens**

FRD has developed specific ELISA methods for the presence of hazelnut, almonds and crustaceans, as well as a multi-nut screening assay for peanuts, hazelnut, brazil nuts, almonds and cashew nuts in food products. FRD continued to optimize these methods and to develop standard operating procedures for the preparation of reagents and test implementation by the user. FRD worked closely with CFIA through the establishment of Allergen Method Committee and through the provision of training and assistance to specific CFIA laboratories. FRD entertained a number of scientists from the US FDA

Center for Food Safety and Applied Nutrition (CFSAN) and demonstrated newly developed methods for them. CHHAD has initiated a review of labelling issues related to food additives with potential allergenicity and participated in the drafting of a regulatory proposal for enhanced labelling of priority allergens in food products. CHHAD also provided advice to CFIA on potential risks to human health resulting from the presence of allergens in food. TRD scientists organized and hosted an international Workshop on Animal Models of Allergenicity in November 2001 to examine the feasibility of developing animal models for detection and testing of food allergens. The proceedings from the Workshop are in press in the peer-reviewed journal, *Environmental Health Perspectives*.

## **Food Irradiation**

The Food Irradiation Policy Team (FIPT) led by CHHAD has undertaken policy activities in connection with the completion of four major irradiation submissions which led to the pre-publication of regulatory proposals in a Schedule of Amendments. Mangoes, poultry, ground beef and shrimp would be added to the list of foods that are permitted for irradiation in the Table to Section B.26.005 of the FDARs. Pre-publication of this Schedule in the *Canada Gazette* Part I was followed by public information and consultation sessions, planned by FIPT, in major Canadian cities. CHHAD continued to provide advice to CFIA, other agencies and the public on issues related to the safety of irradiated food.

## **Food Packaging and Incidental Additives**

CHHAD has completed the pre-market review of 4,418 food packaging material submissions (including 28 with toxicity components) and 1,990 incidental additive submissions (including one with toxicity components). With more and more emphasis being placed on solid waste reduction, the Division has seen an increasing number of submissions on food packaging materials that are produced from post-consumer recycled plastics. As a result, several new plastic recycling processes have been evaluated by CHHAD and letters of opinion (i.e. no objection) have been issued for their use in producing materials that comply with the general safety requirements of Section B23.001 of the FDARs.

Discussions have been held with FDA/CFSAN in the United States and with the European Commission to develop a framework for a mutual recognition of technical reviews for food packaging and other food contact materials. An executive summary of this initiative has already been drafted by FDA. CHHAD evaluators will be participating in the development and implementation of the proposed framework which is scheduled to be finalized by 2006.

A document has been drafted describing the information requirements for making

submissions regarding food packaging materials submissions. CHHAD hopes to have this document posted on the HC website in the future to assist food packaging material suppliers in making proper submissions (i.e. ones that contain all the necessary information and data) to the Branch.

## **Food Contaminants**

### **Dioxins, Furans and Planar Polychlorinated Biphenyls**

FRD has expanded the method for dioxins, furans and planar polychlorinated biphenyls (PCBs) (D/F/P) to include all PCBs in the measurement. The method was validated through participation in the Norway 2001 inter-laboratory study involving three food matrices (i.e. cod liver, beef, human milk). FRD's results were mostly within one standard deviation of the mean of those reported by the 50 laboratories participating in the study.

Surveys of D/F/P in total diet composites from Whitehorse (1998), 16 human blood and biological samples were completed. D/F/P exposure from total diet samples showed a human daily intake value similar to that found in the last five years, about 45 pg Toxic Equivalents, which was lower than that observed 10 years previously.

Results generated from the D/F/P surveys have supported CHHAD's ongoing temporal trend analysis of exposure assessment of these contaminants in Canadian foods. This work is part of a larger review of the HC approach to risk assessment of D/F/P. Scientists from FRD, TRD and CHHAD have participated in a number of international conferences, workshops and study groups on D/F/P, and have contributed significantly to methodology development, monitoring and surveillance, and risk assessment of D/F/P.

Surveys of brominated diphenyl ethers (BDEs) flame retardants in approximately 70 total diet composites from Whitehorse were also completed by FRD. Results from this survey indicated the presence in many foods of BDEs that permit calculation of an intake of about 45 ng/person/day. This study is among the first in the world to report on the presence of BDEs in common foods and provides an estimation of human intake.

A planning and coordination meeting was held between FRD and the Regional Food Laboratories to discuss national monitoring needs, including the Total Diet Program, Child Health and the Fish Survey. Individual laboratories were identified to conduct the analyses. A total diet survey (sample pick up and processing only) was completed in St. John's, Newfoundland, and organized for Vancouver. CHHAD has recently conducted a number of health hazard assessments involving D/F/P. The Division is also leading science and policy teams that are reviewing the hazard characterization of these substances and re-examining strategies to minimize risks to human health.

### **Chlordane and Toxaphene**

TRD has completed the animal component of new tissue distribution studies of oxychlordan, *trans*-nonachlor and *trans*-chlordane in rats. Tissue extracts were prepared and analysed in TRD for oxychlordan, *trans*-nonachlor and *trans*-chlordane. Samples of these extracts were delivered to Environment Canada collaborators for oxychlordan and *trans*-chlordane enantiomer analyses, which were completed in 2002.

TRD has completed histopathological evaluation of tissue samples of all monkeys from the toxaphene studies. Work has begun on immunohistological and other molecular marker evaluation of tissue samples. Gene analysis and protein expression of cytochrome P450 and cell cycle genes in liver and kidney of female monkeys showed no significant changes by toxaphene. TRD continued to conduct toxaphene body burden analyses in all monkeys. Work was also initiated to use DNA micro-array methods for simultaneous monitoring of multiple gene expression changes in monkey tissues.

In collaboration with HECSB, TRD has conducted a study to examine the developmental, neurobehavioral and toxicological effects of exposure to a mixture of environmentally relevant persistent organic pollutants in rats. This study was funded by the Toxic Substances Research Initiative (TSRI). Collection and processing of tissue samples from rat pups at several post-natal developmental stages have been completed. Histopathological and molecular evaluation of tissue samples for markers of neuronal injury and neurodevelopment for correlation with the expected neurodevelopmental stage of the pups were initiated.

### **Trace Toxic Elements**

CHHAD has contributed to the preparation of a HC advisory on mercury levels in fish. An information sheet on mercury in fish was also developed for the FD website. CHHAD continued to provide advice to CFIA, other agencies and the public on matters related to the health risk of mercury and other toxic elements (e.g. arsenic, lead, cadmium) in food products.

Method development was initiated by FRD for total mercury and methylmercury to be applied in a survey of fish products sold at retail in Canada. Objectives of the survey were to assess levels of mercury and methylmercury, other trace elements, D/F/P, pesticides and veterinary drugs in fish (e.g. wild versus farmed, marine versus fresh water, imports versus domestic). Fish samples were picked up and processed under contract in readiness for analysis.

To examine whether diets can influence the toxicity of mercury, the TRD has completed an NCP-funded, 14-day toxicity study with different doses of methylmercury in male rats maintained on different diets for 28 days prior to methylmercury dosing. Processing and analyses of the collected tissue samples are ongoing.

TRD conducted a TSRI-funded collaborative study to examine the effects of tributyltin on steroidogenic enzymes of the reproductive tracts of rat pups born to dams exposed to this contaminant. Tissue distribution determination of residual tin, and immunotoxicological and histopathological evaluation of rat tissues are ongoing. In addition, the market basket study of organotin intake in human food is also underway.

### **Mycotoxins**

CHHAD carried out a number of health risk assessments on monitoring data received from the Health Canada Regional Food Laboratories, and provided advice to CFIA and other regulatory agencies regarding the presence of mycotoxins in food products. In collaboration with Bureau of Biostatistics and Computer application, CHHAD has initiated conventional exposure assessment and probabilistic exposure assessment of mycotoxins on surveillance data generated in the regions of Ontario, Nunavut, and Manitoba and Saskatchewan. CHHAD scientists also participated in JECFA and CFAC meetings for the review and standards-setting activities related to mycotoxins.

FRD optimized and developed better methods for the measurement of mycotoxins in food supply (i.e. *Alternaria* mycotoxins in fruit juices and wines, fumonisin in rice flour and cornflakes). Protein-bound fumonisin, which was not measured by conventional analytical procedures, was observed in cornflakes; it was extracted (in addition to other fumonisins) with a detergent solution. If bioavailable to humans, this “hidden” fumonisin could be of health significance. Studies are being conducted by FRD to assess the presence of this bound form in other food commodities (e.g. tortilla chips).

TRD initiated an animal study and completed mutagenicity testing of mycotoxins produced from *Alternaria* in Ames strains TA 102 and TA 104, and rat hepatoma H411E cell lines. Results suggested the involvement of oxidation and nitrosylation metabolic pathways in the activation of mutagenic activity of *Alternaria* mycotoxins, but few toxic effects at the doses used in the animal study.

### **Seafood Toxins and Biotoxins in Foods from Aquatic Environments**

FRD completed the publication of the HPLC method for paralytic shellfish poisoning, which has been collaboratively studied by 23 participating laboratories from 16 countries during the year. Results from the collaborators have been evaluated and submitted to AOAC International for approval as an Official First Action Method.

In collaboration with the Quebec Ministry of Environment, the Ontario Ministry of Environment and the University of Quebec at Montreal, FRD conducted the determination of microcystins (i.e. toxins produced by blue-green algae) in fish and water samples from Quebec and Ontario lakes.

CHHAD provided advice on health risk of microcystins in blue-green algal products to consumers, industry and government institutions. Appropriate compliance action on these products has been discussed with CFIA.

TRD in collaboration with CFIA and NRC, completed a rat study to determine the toxicity of spirolides, a new class of seafood toxins. Histopathological and neurotoxicological evaluation of tissues is in progress. In vitro studies to determine the neurotransmitter related mechanisms of action of these toxins are also in progress.

## **Veterinary Drugs**

FRD developed a liquid chromatography-mass spectrometry (LC/MS/MS) method for the analysis of carbadox and its metabolites, including desoxycarbadox, to 0.01 ppb in pork liver and kidney. FRD was the first laboratory in the world to find residues of desoxycarbadox in pork liver. The detection of these compounds in pork livers and pork meat samples from the Ontario Ministry of Agriculture and Food, and BBQ pork kidney samples from the Alberta Ministry of Agriculture, supported VDD's regulatory action on carbadox.

## **Emergency Preparedness**

All Bureau Divisions collaborated in the preparation of a joint Standard Operating Procedure (SOP) with CFIA to address laboratory procedures to be followed in the event of an emergency incident (terrorist or otherwise), involving both capacity and capability components. The Divisions collaborated in the preparation of an internal SOP to address procedures to be followed in the event of a request for assistance from CFIA in an emergency situation. They also participated with CFIA in a number simulated emergency response scenarios.

Scientists in CHHAD, FRD and TRD also engaged in the preparation and submission of proposals to the CBRN Research and Technology Initiative (CRTI) on methods development related to food emergency response.

## **Acrylamide in Food**

Bureau scientists have conducted preliminary analytical studies to estimate the presence of acrylamide in foods. The analytical method to determine acrylamide has now been validated. They also discovered the major route for the formation of acrylamide in baked or fried carbohydrate-rich foods. The Bureau was the first in the world to report this finding and the information was posted on the WHO website. Such information has provided a key as to how the presence of acrylamide in foods can be minimized. HC has shared its research findings on the formation of acrylamide with the Canadian public, the Canadian food industry and our international partners.

The Toxicology Evaluation Section of CHHAD has reviewed the available information on the toxicity of acrylamide. Based on animal studies, acrylamide has been categorized as a probable human carcinogen, but it is not known if acrylamide levels found in food pose a human health risk. Additional research needs have been identified and international initiatives are being monitored so unnecessary duplication is avoided. The World Health Organization and the United Nations Food and Agriculture Organization hosted an international meeting of experts on the public health impact of acrylamide in foods in late June 2002. A number of recommendations were made, including the establishment of an international network that would share data and coordinate research efforts. The Bureau actively participates in the data-sharing process.

#### **4. FUTURE CHALLENGES AND PRIORITIES**

BCS made a significant contribution providing advice on food safety issues to a variety of clients and responding to emerging scientific and regulatory challenges. A number of external factors, such as globalization, consumer preferences, public concern about food safety and the environment, have altered the context in which research and regulatory activities are conducted.

The Bureau planning process needs to be more anticipatory and strategic in its use of increasingly limited resources. The Bureau will remain active in the area of research along the food continuum, including surveillance and food monitoring, emergency response, and the identification of risks for vulnerable groups and from foods derived from new technologies.

##### **Specific Challenges and Priorities—Highlights**

- Strengthen and streamline existing pre-market evaluation programs for greater efficiency and to ensure that emphasis and resources are correctly placed on issues of highest priority from a human health perspective.
- Keep abreast of latest developments in the area of quantitative risk assessment to ensure that assessments conducted by BCS are up-to-date and of the highest quality.
- Continue to enhance international communication and harmonization activities in food chemical safety from both a North American perspective as well as a broader global scale.
- Continue close collaboration in the area of food allergens with CFIA and pursue collaboration with US FDA, Joint Research Centre of the European Commission and the UK Department of Agriculture and Rural Development.
- Initiate development of confirmatory methodology for allergen identification based on protein and peptide identification using LC-MS-MS, and extend protein studies into the identification and analysis of “foreign” protein produced in GM

foods.

- Participate in cooperative studies with US FDA, US National Food Producers Association and AOAC International for the evaluation of commercial peanut test kits.
- Continue the establishment and coordination of programs to develop a battery of rapid screening tests for known (and unknown) priority chemical contaminants in foods, feeds and water.
- Continue participation in, and contributions to, the Chemical Cluster of the CRTI on behalf of BCS laboratory component.
- Complete development of methodology for both total mercury and methyl mercury, complete survey of appropriate “fish” homogenates, and undertake a survey of same homogenates for pesticides (Ottawa), and for veterinary drugs and D/F/P (Western Region).
- Continue to coordinate program to complete Total Diet samples from Ottawa, St. John’s, and Vancouver for trace elements, D/F/P, veterinary drugs and pesticides.
- Continue studies to further refine analytical methodology and apply to variety of foods to estimate dietary exposure of Canadians to acrylamide, giving emphasis to foods consumed by infants and children.
- Continue research on ways to reduce levels of acrylamide in foods by investigating (in collaboration with appropriate partners) mechanisms of acrylamide formation, inhibition and effects of process changes on acrylamide levels.
- Initiate toxicological research on acrylamide to address health-related effects, such as neurotoxicity, carcinogenicity and immunotoxicity.
- Complete, in the area of novel foods, multi-generation and cancer studies, validate animal models and in vitro methods, and continue biomarker development using DNA arrays and proteomics to address issues related to the development and refinement of tools for whole food testing and toxicological assessment of GM foods.
- Continue data gathering, methods and biomarker development, and validation in the areas of carcinogenesis, mutagenesis, reproductive and developmental toxicity, immunotoxicity and neurotoxicity to enhance health risk assessment of food-related chemicals.
- Collaborate with a variety of internal and external partners on various research projects and regulatory issues.
- Develop and update various food chemical related standards as appropriate to ensure the continued safety of the Canadian food supply.

## **5. THE TEAM**

### **Director’s Office**

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## 6. VISITORS AND OTHER ACTIVITIES

The Bureau has hosted two visiting scientists, four postdoctoral fellows, one graduate student and three co-op students who have contributed their ideas to existing and new research projects. Several staff members hold an adjunct professorship status at various universities. In addition, Bureau members have actively participated in several workshops held nationally and internationally, and given scientific and regulatory advice. They also organized the Workshop on Animal Models to Detect Allergenicity to Foods and Genetically Modified Products (November 2001), and the Federal Food Safety and Nutrition Meeting (October 2002). In addition, they were requested to be an Expert Advisor to the Ontario Medical Association, Committee on Drugs and Pharmacotherapy.

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## 9. PRESENTATIONS

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