INAF
INSTITUTE OF NUTRITION
AND FUNCTIONAL FOODS

Activity Report
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A Word from the Directors

It is with great pride that we present this report on INAF activities during 2009–2012. Our major accomplishments and the ongoing efforts of all INAF members in the areas of research, training, and transfer have shaped our development and made our institute into a strategic organization now known for its scientific, economic, and social relevance.

In today’s world, where the link between diet and public health is a concern of all industrialized countries, INAF has carved out a niche in this multidisciplinary and highly competitive arena at the intersection of science, engineering, and the health and social sciences. Given our focus on individual health through diet, we must adhere to a rigorous and responsible approach, both scientifically and socially. Now more than ever our slogan, “Science enhancing nutrition,” makes perfect sense to INAF’s researchers and partners, and the public at large.

As you will discover in this report, 2009–2012 was marked by major work, both literally and figuratively. We need only mention our massive infrastructure project, the renewal of our FRQNT funding, and the creation of a joint institute with Université de Bordeaux. In a world where the international community is increasingly consolidating into large networks to confront today’s many scientific and innovation challenges, INAF must continue its efforts to internationalize. By virtue of its leadership role, INAF’s reputation now extends far beyond Québec’s borders.

We hope that in reading this activity report, you will discover the full spectrum of our team’s creativity, drive, and energy.

Happy reading!

Renée Michaud
Executive Director and Director of Development

Yves Pouliot
INAF Director
INAF AT A GLANCE

The Power of an Extensive Network

INAF is a team of Québec researchers working together to advance knowledge about foods and the complex relationships between their components, nutrition, and health. Over the past decade INAF has become the largest team of its type in Canada.

<table>
<thead>
<tr>
<th>MISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To improve human nutrition through basic, applied, and clinical <strong>RESEARCH</strong> on foods and compounds that promote health</td>
</tr>
<tr>
<td>• To contribute to the <strong>TRAINING</strong> of highly qualified personnel</td>
</tr>
<tr>
<td>• To ensure the <strong>TRANSFER</strong> of knowledge and technology</td>
</tr>
<tr>
<td>• To support <strong>INNOVATION</strong> in the industry and in health approaches</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To develop knowledge about the production and processing of foods and their constituents</td>
</tr>
<tr>
<td>• To support the development of healthy foods composed of safe and effective ingredients</td>
</tr>
<tr>
<td>• To understand and validate the role of these foods and their ingredients in human health and in the prevention of chronic diseases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To promote open-mindedness, creativity, and cooperation</td>
</tr>
<tr>
<td>• To share resources and knowledge</td>
</tr>
<tr>
<td>• To adhere to ethics and demonstrate scientific rigorousness</td>
</tr>
<tr>
<td>• To pursue excellence</td>
</tr>
<tr>
<td>• To value multidisciplinary and intersectoral approaches</td>
</tr>
<tr>
<td>• To act in response to society's needs</td>
</tr>
</tbody>
</table>

INAF’s interest groups are interconnected units showcasing our integrated research in key economic sectors. Through the implementation of pivotal projects and knowledge transfer activities, they generate positive interactions with sector stakeholders and companies by stimulating interest and promoting partnerships. By encouraging interdisciplinary projects, they serve as powerful engines, driving INAF’s scientific program.

**The STELA Centre** is INAF’s interest group on milk and milk products. It works on expanding the value chain for milk and its constituents through the development of functional bio-ingredients for human health.

**The interest group on plant products** coordinates research efforts devoted to extracting and using compounds from fruits and vegetables, grains, medicinal plants, and timber and non-timber forest products.

**The interest group on marine products** unites INAF’s preclinical and clinical study expertise with the scientific and technical know-how of marine biotechnology research groups from the Bas St-Laurent and Gaspésie regions.
INAF between 2009 and 2012 at a glance

<table>
<thead>
<tr>
<th>MORE THAN:</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>clinical studies</td>
<td>33</td>
</tr>
<tr>
<td>members</td>
<td>75</td>
</tr>
<tr>
<td>professionals, assistants, and highly qualified technicians</td>
<td>80</td>
</tr>
<tr>
<td>partners</td>
<td>300</td>
</tr>
<tr>
<td>projects</td>
<td>450</td>
</tr>
<tr>
<td>students and interns</td>
<td>560</td>
</tr>
<tr>
<td>articles published in peer-reviewed journals</td>
<td>620</td>
</tr>
<tr>
<td>scientific papers presented</td>
<td>1,200</td>
</tr>
</tbody>
</table>

$15,000,000 invested in infrastructure and equipment

$58,500,000 allocated to research

INAF, A to Z


Visit the INAF website and learn more about INAF’s research themes, member expertise, latest news, upcoming events, and much more.

www.inaf.ulaval.ca
Happy birthday!

On June 16, 2011, INAF celebrated 10 years of existence by throwing a research, food, and health party. Besides INAF members and personnel, more than 250 institutional, governmental, and industrial partners came to show their appreciation and attest to the relevance of the work done by INAF researchers. The enthusiasm and dedication of our directors and professional and scientific staff were also noted.

The year 2010–2011 also marked the 25 year anniversary of the founding of STELA. The festivities kicked off on June 11, 2010, with a scientific symposium and a banquet at which many industrial and institutional actors were honored. In the following months, scientific activities for the general public, dairy industry partners, and nutritionists put STELA in the spotlight.

Other highlights of STELA’s 25th anniversary

- Release of a historical document retracing milestones in STELA’s history, including testimonials from industry partners, academics, and former students.
- Awarding of an honorary doctorate to Professor Jean-Louis Maubois of INRA de Rennes by Université Laval. His significant research and technology contributions to the dairy industry inspired STELA’s founders.
- Publication, in October 2011, of a special edition of the journal Dairy Science and Technology (Elsevier) solely devoted to STELA researchers.

From left to right: Yves Pouliot, Director (INAF); Jean-Paul Laforest, Dean (FSAA); Renée Michaud, Executive Director (INAF); Paul Fortier, Vice-Chancellor, Research (U. Laval); Geneviève Tanguay, Deputy Minister (MDEIE); Richard Cloutier, CEO (CQVB); and Dominique Fortin, Deputy Minister (MAPAQ).

More than 300 people attended INAF’s 10th birthday celebration at an open house event run by INAF researchers, professionals, and students. The young stars of the show Les Chefs, Arnaud Marchand and Marjorie Maltais, organized a culinary presentation that was both spectacular and delicious!

Former STELA directors (left to right): Yves Pouliot, Christophe Lacroix, Sylvie Turgeon, Paul Paquin, and Jean Amiot.
INAF marks new milestones of excellence

In the spring of 2011 INAF’s 2012–2017 operating grant was renewed under FRQNT’s strategic clusters program. The $465,000 annual amount represents a 50% increase over the previous grant—an outstanding achievement given the highly competitive research funding environment.

In 2010 this same caliber of competitiveness and excellence earned INAF one of the prestigious grants awarded by the NSERC CREATE Program (2010–2015, $1.65 million), which allowed us to establish the Food Advancement through Science and Training program (FAST) jointly with the University of Manitoba’s RCFFN and CCARM centers.

The creation of Institut de nutrition Aquitaine-Québec in collaboration with Université de Bordeaux and the establishment of an innovation support team for bio-food companies are two other major steps in INAF’s development you can learn more about in the pages that follow.

A $1.65 million grant from the NSERC CREATE Program allowed INAF to establish a one-of-a-kind training program jointly with the University of Manitoba’s RCFFN and CCARM centers.

State-of-the-art facilities (INAF Phase II)

Between 2009 and 2011 INAF underwent one of the most significant construction projects in its young existence. The first infrastructure expansion phase, in the early 2000s, took place in an unoccupied wing of Université Laval’s Pavillon des Services. Not so for the second expansion and modernization phase, which displaced many teams, forcing them to temporarily relocate. The work, completed in 2011, was funded by a grant from MDEIE as part of its infrastructure funding aid program, and by a major contribution from Université Laval and FSAA.
INAF significantly expanded its infrastructure in 2009–2011. The expansion was needed to accommodate the organization’s rapid growth and an increase in the number of projects and clinical studies. Today INAF has the largest clinical nutrition research facility in Canada.

**Available platforms:**
- A number of preclinical in vitro and in vivo models
- Large biological material banks
  - Lactic acid bacteria and probiotic strains
  - Enteroviruses
  - Samples of plasma, saliva, etc.
- Facilities for studying food perception and eating behavior
  - Dining rooms
  - Focus group room

A number of other laboratories and specialized equipment supervised by INAF researchers are also available in partner units and institutions. These include a food mycology lab, three Level 2 containment labs for studying pathogenic microorganisms (food virology, meat microbiology, the only in vitro digestion simulator in Canada), as well as high performance microscopic and medical imaging platforms. INAF members also have access through our partners to an animal holding facility, experimental farms, and state-of-the-art aquaculture and marine science equipment.

### One-of-a-kind Research Facilities in Canada

**INFRASTRUCTURE PHASE I – 1999**

$17,300,000

Canada Foundation for Innovation, the Québec government, and several other partners

- Introduction of ultra performance technology platforms
  - Analytical chemistry
  - Food processing pilot laboratory
  - State-of-the-art genomic and proteomic equipment
  - Animal holding facility
  - Clinical nutrition investigation unit
    - Metabolic kitchen, dining room, sampling room, consultation rooms

**INFRASTRUCTURE PHASE II – 2008**

$8,200,000

Ministère du Développement économique, de l’Innovation et de l’Exportation, Université Laval, and FSAA

- Addition of new laboratories
  - Nutrigenomics
  - Cell culture
  - Intestinal microbiology (P2)

- Expansion of the clinical nutrition study unit—now the largest in Canada
  - Sampling room capacity doubled
  - Metabolic kitchen capacity doubled
  - Addition of a densitometry room
  - Addition of a number of nutrition assessment rooms

- New work space added
  - Innovation support service
  - Food perception and eating behavior analysis lab

When the *in vitro* digestion lab was renovated, a biofermenter and anaerobic room were added, making this an important facility for the study of intestinal microbiota.

With the expansion of the clinical unit, the number of nursing procedures doubled. Since January 2011, the new sampling room has welcomed 15 to 30 subjects per day, for an average of 400 per month.
INAF’s research program comprises three highly complementary research themes.

### RESEARCH THEME 1
**Biomolecule identification, characterization, and functionality**

A number of bioactive constituents contribute to food-related health effects. These include proteins and peptides, lipids, polysaccharides, phytochemicals, and lactic acid bacteria and probiotics.

**OBJECTIVES**
- Develop bioactive molecules from natural land-based and marine sources, bacteria, plants and animals, and their co-products.
- Characterize the molecular and functional properties of bioactive molecules and microorganisms.
- Understand the structure/function relationship of biomolecules and the mechanisms of action underlying their physiological activity.

### RESEARCH THEME 2
**Technologies and processes for matrices and functional foods**

The main challenges associated with this theme involve maximizing the quality, efficacy, and safety of bioactive compounds and developing new functional food concepts.

**OBJECTIVES**
- Develop new technological strategies to produce, extract, and concentrate bioactive compounds and incorporate them into food matrices.
- Study the impact of the food matrix on the stability, bioactivity, and health effects of bioactive compounds.
- Develop new matrices for the protection, transportation, and release of fragile biomolecules.
- Validate the impact of new technological processes on the microbiological quality of foods and on food safety.
- Formulate new functional beverage and food product lines.

### RESEARCH THEME 3
**Nutrition and health**

INAF researchers have expertise in developing and validating preclinical and clinical models, nutrigenomics, and human behavioral studies.

**OBJECTIVES**
- Highlight the contributions of functional biomolecules to metabolism, immunity, and inflammatory precursor conditions associated with chronic disease.
- Study the effect of bioactive ingredients and functional foods on human health at every stage of life, specifically in the prevention of chronic diseases and aging-related disorders.
- Link an individual’s genes, response to diet, and predisposition to certain metabolic diseases in a preventative context.
- Understand eating behavior and study key factors associated with the successful adoption of healthy eating habits.

INAF wishes to acknowledge the financial support of FRQNT as part of its strategic clusters program.
Some Research Themes

INAF’s technological expertise makes it possible to benefit from the most minor components of foods and encourages the use of co-products that are little-known or overlooked.

Milk and dairy products
The STELA Centre is a major catalyst of innovative projects aimed at discovering and exploiting the full potential of milk as a high quality food and its many derivatives in numerous applications. For example, milk proteins are a choice material for developing protection matrices and pharmaceutical coatings. Their texturizing and gelling properties also play an important role in satiety. In addition, there is interest in milk derivatives, like buttermilk and whey, and the potential role of cheeses as ideal excipients for active ingredients like probiotics.

Marine products
Thanks to separation and fractionation processes carried out on numerous fish and marine product extracts, we were able to test and demonstrate their potential human health benefits. We can cite, for example, approaches that combine enzymatic hydrolysis and fractionation of hydrolysates by isoelectric focusing and by baro- and electro-membrane processes. Possible applications of this rich and abundant biomass range from its antimicrobial potential in food products (peptides derived from snow crab co-products) to its ability to modulate glycemic response (bioactive brown algae derivatives).

Plant products
Both wild plants and cultivated fruits and vegetables contain a myriad of compounds beneficial to health. The main task at hand is to harness these components by teasing out their secrets and identifying the best ways to take advantage of their full potential. Polyphenols, in particular, have been the subject of numerous multidisciplinary studies tying technology to preclinical and clinical validation.

Food safety
The notorious meat and cheese crises of recent years are sad reminders of how crucial it is to develop tools to detect and control pathogenic organisms in food. Food safety casts a much wider net however, including the designation of what is toxic or harmful. Ingredients and active components, for example, must not only be effective but also safe and without harmful effects. Food safety work at INAF also looks at how to limit the long-term adverse effects of certain food components. For example, we’ve developed new catalysts to limit the formation of trans fats during oil hydrogenation and new processes that decrease the levels of sodium, nitrites, and other additives without compromising food safety and shelf life.

In addition to the major themes of the scientific program presented above, other research themes emerged during 2009–2012 that will be expanded on in the future.
Nutrigenomics and epigenetics: The future of nutrition

At INAF we study certain genes expressed in obese individuals to discover the genetic (mutations) and epigenetic factors (methylations) associated with the metabolic complications of obesity, such as diabetes and cardiovascular diseases. Nutrigenomics and epigenetics—two thriving new scientific disciplines—will make it possible to:

- Understand the factors that predispose certain individuals to obesity
- Identify at-risk individuals
- Develop more suitable treatment programs
- Develop nutrition-targeted public prevention strategies

The Canada Research Chair in Genomics Applied to Nutrition and Health, which is central to INAF's efforts in this area, has engendered a host of new and very promising collaborations.

Nutrition, growth, and aging

This theme was added to the program in recent years and has witnessed considerable growth with the addition of new members from Université de Montréal and Université de Sherbrooke's Research Center on Aging. In INAF’s scientific program, the role of nutrition in human health and the prevention of chronic diseases now covers all stages of life, from pregnancy to menopause and the senior years. Healthy aging, cardiovascular health, bone health, and cognitive health are all central to this work, which is especially relevant in the current socio-demographic context. This theme, which constitutes one of INAQ’s three main areas of research, has given rise to a number of collaborations with Université de Bordeaux researchers.

Consumer behavior

INAF’s latest field of research is the study of consumer behavior. We set up a new multidisciplinary nutrition research team to work alongside psychological and social service researchers. This has opened the door to a whole new generation of projects and unprecedented observation/analysis techniques at INAF. Perceptions of the health value of foods, the impact of nutrition labeling on food intake, nutrition decision-making parameters, and the study of psychosocial determinants of dietary habits and consumer choices will yield valuable information on the value and effectiveness of preventative health messages to the public.
A Productive Organization

INAF funding: Growth and diversity

INAF relies on major federal (NSERC, CIHR) and provincial (FRQNT, FRQS) granting agencies to provide the majority of funding for its research programs. Additional funding comes from private industry sources (agricultural and dairy associations, etc.) and health research foundations (heart, diabetes, and Alzheimer associations, etc.). Research contracts, Université Laval’s institutional contribution, and a variety of key initiatives organized by INAF management complete the picture.

- Total grants for research projects increased by 36% from 2009 to 2012, mainly due to an increase in team projects.
- Research chair and equipment grants were relatively stable.
- The operating budget reached $2.4 million in 2011–2012, a 40% increase.
- The value of research contracts rose from $0.7 to $1.1 million, largely due to the new innovation support service.

INAF research is a team affair

More than half (51%) the funding received by INAF researchers comes through team projects. Over 165 research projects are funded by grants annually. Nearly twice as many team projects (105) as individual projects (59) are carried out each year.

Dissemination of research results: A collective effort

INAF researchers published more than 600 articles in peer-reviewed international scientific journals in the past three years. An additional 1,200 lectures, papers, posters, and other presentations enabled us to disseminate our work and build INAF’s reputation worldwide.
INAF pilot projects: A strategic investment

INAF invested $90,000 over three years—bringing no fewer than 15 pilot projects to fruition. These projects fostered the development of new inter-theme and inter-university multidisciplinary collaborations that generated preliminary data, which in turn helped us obtain support from major research funding organizations. The spinoffs from our initial investment are impressive: pilot projects generated more than $1.3M in new grants, a leverage effect estimated at roughly $15 for each $1 INAF invested. These projects enabled our teams to:

- Develop new nutritional biomarkers related to cardiovascular health
- Validate the bioavailability of DHA in the brain and proanthocyanidins in plasma
- Establish a new multidisciplinary research team to study the role of intestinal microbiota in the prevention of chronic diseases
- Develop an experimental approach to study the role of the food matrix in satiety
- Verify the roles of vitamin D and calcium in bone health and gestational diabetes
- Generate preliminary results that led to new grants from NSERC, FRQNT, CIHR, FRQS, the Canadian Diabetes Association, and others

Pilot projects: Worthwhile investments in research

Chairs

The presence of research chairs in a research organization is a sure indicator of the excellence and relevance of its work. From 2009 to 2011, INAF had no fewer than 15 active research chairs.

CANADA RESEARCH CHAIRS

- Chair in Lactic Cultures Biotechnology for Dairy and Probiotic Industries
  - D. Roy
- Chair in Genomics Applied to Nutrition and Health
  - M.C. Vohl
- Chair in Dietary Fatty Acids and Cognitive Function during Aging
  - S. Cunnane
- Chair in Protein Physicochemistry, Biosystems, and Functional Foods
  - M. Subirade
- Chair in Nutrition, Functional Foods, and Cardiovascular Health
  - B. Lamarche
- Chair in Physical Activity, Nutrition, and Energy Balance
  - A. Tremblay
- Chair in Animal Reproductive Applied Functional Genomics
  - M.A. Sirard

PARTNER RESEARCH CHAIRS

- NSERC Industrial Research Chair on Nutritional Control of the Production of Milk Components in Dairy Cows
  - Y. Chouinard
- Chair in Human Nutrition, Lipidology, and Cardiovascular Disease Prevention
  - B. Lamarche
- J.A. DeSève Research Chair in Nutrition
  - É. Levy
- Pfizer-CIHR Research Chair on the Pathogenesis of Insulin Resistance and Cardiovascular Disease
  - A. Marette
- NSERC Dairy Sector Industrial Research Chair in Cheese Technology and Typicity
  - D. Roy
- Lassonde Research Chair in Nutrition, Innovation, and Health
  - S. Turgeon
- Egg Industry Economic Research Chair
  - M. Doyon
- Research Chair in Bariatric and Metabolic Surgery
  - A. Tchernof
Clinical studies

With more than 400 participants passing through the clinical unit every month, the clinical nutrition studies research field is INAF’s main conduit to the public at large. As always, we study the effects of foods or food ingredients on various health and disease risk indicators, including hypertension, inflammation, glycemic response, dyslipidemia, and immune markers. We are increasingly interested in the satiating effects of foods and the long-term effects of diet and gestational diabetes on pregnant women. We are also studying the psychosocial determinants of eating behavior, for example by looking at perceptions of the health value of foods and the impact of nutrition labeling on food intake. From 2009 to 2012, thirty-three clinical studies were conducted at INAF, including several projects in the areas of nutrigenomics, epigenetics, and eating behavior.

Innovation and research partnerships

INAF’s strong suit has always been its balance between basic and applied research, and its emphasis on researchers working in concert with research results users. Every year an average of 40% of the research budget comes from private funds. These partnerships include pivotal projects like the industrial research chairs, the CRD and INNOV projects supported by NSERC and CRIBIQ, and contracts. Since 2009 more than a hundred companies have been involved in such projects.

More than 100 companies have been involved in research projects since 2009

They come mainly from the biofood sector (Biscuits Leclerc, Saputo, Agropur, Lassonde, Boulangerie St-Méthode, Aliments Ultima) and the health and nutrition sectors (Atrium Innovations, InnoVactiv, Pfizer). Some multinationals have also signed on as research partners (Nestlé, Danone, McCormick, General Mills).

The goal of the NSERC INNOV program is to accelerate the precompetitive development of promising technologies and promote their transfer to a company. Here is a list of some INNOV projects completed in 2009–2012.

INNOV PROJECTS COMPLETED BETWEEN 2009 AND 2012

<table>
<thead>
<tr>
<th>Description</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formation of a hypocholesterolemizing product based on chitosan</td>
<td>J. Gagnon</td>
</tr>
<tr>
<td>Development of immunoactive peptide extracts</td>
<td>S. Gauthier, Y. Pouliot et Y. Boutin</td>
</tr>
<tr>
<td>Development of protein excipients for the controlled release of active ingredients</td>
<td>M. Subirade et M. Lessard</td>
</tr>
<tr>
<td>Bioactive extracts with cosmeceutical properties</td>
<td>S. Turgeon et V. Moulin</td>
</tr>
<tr>
<td>Optimization and scale up of a new technological approach for producing antioxidant-enriched juices</td>
<td>L. Bazinet et Y. Desjardins</td>
</tr>
</tbody>
</table>
Since 2009 INAF has had an innovation support service partly funded by MAPAQ. This service aims to support and accelerate innovation in the health food and ingredient private sector. With its multidisciplinary team, it is able to meet a variety of technological, nutritional, regulatory, economic, and strategic needs. For industry, this new platform means easier access to the high-level expertise of INAF researchers and help for companies seeking to innovate. From 2009 to 2012, the innovation team assisted in 36 projects with small, medium, and large companies including the following:

- General Mills
- Danone
- Agropur
- Lassonde
- Leclerc
- Boulangerie Saint-Méthode
- Theobroma
- Huiles Orphée
- Saint-Germain
- Khloros
- Biovelia
- And many others!

International collaboration

Considerable effort has gone into cultivating collaboration likely to give rise to lasting international relationships. The signing of a framework agreement between INAF (Université Laval) and Institut de recherche en nutrition humaine en Aquitaine (Université de Bordeaux) to create Institut de nutrition Aquitaine-Québec (INAQ) is one such example. By joining forces, the two organizations seek to capitalize on their complementary assets and expertise to boost the spinoffs from their work on nutrition and aging, i.e., the prevention of neurodegenerative diseases, obesity, diabetes and its cardiometabolic complications, and gastrointestinal disorders.

INAF researchers participate in many other research and training collaborations, notably at major French research centers in Rennes and Lille, in Norway, China, Tunisia, Belgium, and Italy, and also in some Latin American countries, including Brazil and Mexico. In 2009–2012 twenty-four international projects were carried out, and annual funding increased from $365,000 in 2009 to $1.4 million in 2012. The international activities of INAF researchers include participation in international conferences, study and research stays, and welcoming visiting researchers to our labs. In addition, FRQNT awarded a number of our students international scholarships to undertake a 4–12 month internship at a prestigious laboratory in France, Italy, England, or the United States.

See lists of our projects, publications, and clinical studies on the INAF website at www.inaf.ulaval.ca

INAF is active around the world, particularly in France, Norway, China, Tunisia, Belgium, Italy, Brazil, and Mexico

Comprised of a multidisciplinary group of professionals from universities and industry, the innovation support team lead by Paul Paquin (standing) acts as a liaison between companies and INAF’s specialized resources.
Student researchers at the center of action

On average, more than 330 graduate students work under the aegis of INAF each year and co-author over 90% of our publications and papers. This illustrates how a tradition of quality passes from one generation to the next in the research world.

INAF students mirror INAF’s multidisciplinary environment—spanning science and engineering, medicine, and social sciences—and their employment prospects are diverse. INAF’s international reputation attracts an increasing number of students from Europe, Asia, and Africa who choose INAF for their graduate education. Most graduates find jobs quickly and many are called upon to conduct industry-related research in federal and provincial ministries (Agriculture and Agri-Food, Health, Economic development).

The NSERC CREATE program promotes collaborative and integrative approaches to address major scientific challenges, in line with Canada’s research priorities. It helps the next generation of research trainees to become productive employees within Canadian society. By awarding INAF one of its prestigious grants, NSERC provided a major boost to our collaboration with the University of Manitoba’s RCFFN and CCARM centers by establishing the Food Advancement through Science and Training program (FAST).

Beyond its excellence scholarships, the FAST program offers a variety of training activities that support training in research.

This program addresses the pressing needs of companies and organizations in the functional food and health product sector for highly qualified personnel with a broad spectrum of skills who are well equipped to face the challenges in this rapidly growing sector. In addition to its research excellence scholarships, the FAST program provides a number of training activities that allow INAF students to enrich their education and expand across-the-board skills. The two most memorable activities were an intensive summer school (Québec City, June 2011) and a joint symposium organized entirely by students (Winnipeg, June 2012).

No fewer than 42 students of all levels (B.Sc., M.Sc., Ph.D., and postdoctoral) took part in the first FAST summer school, made possible by a grant from the NSERC CREATE program.

In 2011 Guillaume Dolley completed his Ph.D. work on the genetics of small, dense LDL cholesterol particles under the guidance of Dr. Marie-Claude Vohl and Dr. Louis Pérusse. He now works at Québec’s Ministère de la Santé et des Services sociaux.
Transfer

Knowledge transfer

Between 2009 and 2012, no fewer than 1,200 scientific talks and papers were presented at conferences and symposia around the world. INAF has also been a front-line partner in organizing these types of gatherings in Québec and Canada, in addition to member participation in activities within their respective sectors. Healthcare professionals become familiar with our work through activities organized by OPDQ, INITIA, AHIF, and others, as well as through Nutrium training activities. For industry professionals, INAF continues its longstanding collaboration with CQVB and MAPAQ while working to develop new partnerships with industry organizations.

Transfer of technology and know-how

INAF signed a support agreement to nurture new start-up companies like Biovelia, incubated at AG-Bio Centre. This young company markets a delivery system consisting of bioactive compounds that its founders, former graduate students, developed in the course of their doctoral work at INAF. NutraCanada is another technology company that grew out of an R&D program involving several INAF researchers. Founded by researcher André Gosselin, the company develops bioactive compounds extracted from fruits and vegetables. INAF facilitates the sharing of expertise and know-how by working with organizations that offer internships and specialized training, like AG-Bio Centre, Consortium Aliments Santé, and MAPAQ. Collaboration with MAPAQ allows us, among other things, to fund INAF student internships in the fishing industry and at Merinov technology centers.

Abir Nachar and Despina Harbilas, doctoral student members of Pierre Haddad’s team at Université de Montréal, proudly presented their research at an INAQ symposium on nutrition and metabolism held in Québec City in September 2011.

Transfer to the general public

In addition to participating in various public activities, many INAF members collaborate with school organizations in conjunction with nutrition month or educate young athletes about the importance of eating properly.

INAF disseminates information to the general public through its Nutrition and Health Clinic. The clinic provides private consultation services to the public. Clinic dietitians incorporate the latest knowledge and approaches to health and disease prevention in their practice, which focuses on eating behaviors, cardiovascular health, and sports nutrition.

Thanks to its members, INAF is known worldwide, in every forum

INAF disseminates information to the general public through its Nutrition and Health Clinic. The clinic provides private consultation services to the public. Clinic dietitians incorporate the latest knowledge and approaches to health and disease prevention in their practice, which focuses on eating behaviors, cardiovascular health, and sports nutrition.
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- Laurent BAZINET, ALN-UL
- Khaled BELKACEMI, SGA-UL
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAFC</td>
<td>Agriculture and Agri-Food Canada</td>
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<tr>
<td>AHIF</td>
<td>Association for Health Ingredients in Food</td>
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<tr>
<td>ALN</td>
<td>Department of Food Science and Nutrition</td>
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<tr>
<td>CCARM</td>
<td>Canadian Centre for Agri-food Research in Health and Medicine</td>
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<tr>
<td>CDRV</td>
<td>Research Centre on Aging</td>
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<tr>
<td>CIHR</td>
<td>Canada Institutes of Health Research</td>
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<tr>
<td>CQVB</td>
<td>Centre québécois de valorisation des biotechnologies</td>
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<tr>
<td>CREATE</td>
<td>Collaborative Research and Training Experience Program</td>
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<tr>
<td>CRD</td>
<td>Collaborative Research and Development</td>
</tr>
<tr>
<td>CRIBIQ</td>
<td>Consortium de recherche et innovations en bioprocédés industriels</td>
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<tr>
<td>DSRCD</td>
<td>Dairy and Swine Research and Development Centre</td>
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<tr>
<td>EAC</td>
<td>Department of Agri-Food Economics and Consumer Science</td>
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<tr>
<td>FAST</td>
<td>Food Advancement through Science and Training program</td>
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<tr>
<td>FFG</td>
<td>Faculty of Forestry and Geomatics</td>
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<tr>
<td>FMED</td>
<td>Faculty of Medicine</td>
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<tr>
<td>FPHA</td>
<td>Faculty of Pharmacy</td>
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<tr>
<td>FRDC</td>
<td>Food Research and Development Centre</td>
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<tr>
<td>FRQNT</td>
<td>Fonds de recherche du Québec – Nature et Technologies</td>
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<tr>
<td>FRQS</td>
<td>Fonds de recherche du Québec – Santé</td>
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<td>FSAA</td>
<td>Faculty of Agriculture and Food Science</td>
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<tr>
<td>INAQ</td>
<td>Institut de nutrition Aquitaine-Québec</td>
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<tr>
<td>INNOV</td>
<td>Idea to Innovation Program</td>
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<tr>
<td>INRA</td>
<td>Institut national de la recherche agronomique</td>
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<tr>
<td>INRS-IAF</td>
<td>Institut national de la recherche scientifique – Institut Armand-Frappier</td>
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<tr>
<td>MAPAQ</td>
<td>Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec</td>
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<tr>
<td>MDEIE</td>
<td>Ministère du Développement économique, de l’Innovation et de l’Exportation du Québec</td>
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<tr>
<td>NSERC</td>
<td>Natural Sciences and Engineering Research Council</td>
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<tr>
<td>OPDQ</td>
<td>Ordre professionnel des diététistes du Québec</td>
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<tr>
<td>PHY</td>
<td>Department of Plant Science</td>
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<tr>
<td>RCFFN</td>
<td>Richardson Centre for Functional Foods and Nutraceuticals</td>
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<td>SAN</td>
<td>Department of Animal Science</td>
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<tr>
<td>SCRDC</td>
<td>Soils and Crops Research and Development Centre</td>
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<td>SGA</td>
<td>Department of Soils and Agri-Food Engineering</td>
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<td>STELA</td>
<td>STELA Dairy Research Centre</td>
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<td>UdeM</td>
<td>Université de Montréal</td>
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<td>UdeS</td>
<td>Université de Sherbrooke</td>
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<td>UL</td>
<td>Université Laval</td>
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<td>UQAM</td>
<td>Université du Québec à Montréal</td>
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<tr>
<td>UQAR</td>
<td>Université du Québec à Rimouski</td>
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