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A Word from the Director

We are very pleased to present INAF’s activity report for 2008–2009. Over the years, our annual reports have shown ever more clearly the quality and scope of our organization, and as you will see, this year’s version is no exception. The 2008–2009 year was however a particularly demanding one for us all, with many major funding applications, international collaborative projects, and some major initiatives and key projects that did not perform up to expectations.

Nevertheless, in spite of the difficult economic context, the past year has seen the initiation of some new areas of development for INAF. The most important has been the Phase II infrastructure planning, with the expansion of the clinical nutrition unit, the addition of four new laboratories and offices that will accommodate the arrival of new professors as well as a team devoted to facilitating industrial innovation. As we are diligently finalizing this project, other initiatives underway reveal once again the dynamic contribution of our members to the progress of our organization.

The third colloquium organized by student and postdoctoral researchers, with an expanded format extending over two days, attracted over 150 participants with the invitation of many speakers including several INAF alumni now with our partners. Our researchers are now more prominent than ever on the international scene. INAF is in great shape, which bodes well for the future.

At the midpoint of our 2006–2011 strategic plan, we are happy to state that INAF is on course for growth and headed resolutely for international acclaim. Many challenges await, but it is reassuring to observe that, more than ever, every INAF member—researchers, students, support staff, technicians, and management—is on board to help INAF set the pace internationally for the health foods industry.

Thank you to all INAF members and friends!

Yves Pouliot, Ph.D., Director
Together, INAF researchers create a synergy that advances our knowledge of the human diet and its effects on health. INAF’s mission is built around three main objectives:

- Improve the human diet through research and development in basic and applied knowledge of foods and functional molecules
- Contribute to training highly qualified personnel
- Transfer knowledge and technology to industry, health professionals, and the general public

As coalition leader, Université Laval provides INAF, through the Vice Rectorate for Research, with a substantial operating budget and unflagging support as it develops initiatives and major projects. The administrative headquarters and most of its laboratories are attached to the Faculty of Agriculture and Food Sciences (FSAA). FSAA and its Department of Food Science and Nutrition also support INAF operations in many other ways, particularly by providing substantial human and material resources such as laboratories, technical staff, administrative services, and clerical and computer support.

INAF’s work is recognized by Fonds de la recherche en santé du Québec (FRSQ) and Fonds québécois de recherche sur la nature et les technologies (FQRNT).

INAF receives its main operating budget from FORNT under the Strategic Coalitions Program. This program for multi-university coalitions makes it possible for a core group of Université Laval researchers to work synergistically with experts from several other major Quebec institutions.

**The Strength of a Multi-University Coalition**

INAF is a multi-university coalition of acclaimed scientists in numerous disciplines ranging from agrifood to health sciences.

INAF is proud to work in partnership with the following universities and research centres:

- Université de Montréal
- UQÀM
- UQAR
- Université de Sherbrooke
- McGill
- TransBIOTech
- Agriculture and AgriFood Canada
- Agriculture et Agroalimentaire Canada
- Université de Québec / Institut national de la recherche scientifique
RESEARCH

Research this year was characterized by exceptional scientific productivity, as the following pages will show. With a research budget of over $14 million and around 200 projects under way—a quarter of them new—INAF researchers continue to distinguish themselves with their ability to generate new ideas and put together new teams. Several areas of scientific programming are thriving, particularly aging and nutrigenomics as well as microbiology and safety research, very much in the news in 2008. The events described in these pages were a source of great pride for INAF in 2008–2009.

Expanding Facilities, an Investment of Over $8 Million

On Friday, September 26, 2008, Quebec’s Minister of Agriculture, Fisheries, and Food, Laurent Lessard (opposite), officially announced a grant of $6.53 million from the government to expand and renovate INAF’s facilities in Université Laval’s Pavillon des Services. Major contributions from the university and FSAA, who put up $1 million and $0.5 million respectively for the project, brought the total to $8.1 million. Awarded under MDEIE’s infrastructure funding support program, this investment will make it possible to double the size of the clinical investigation unit, allowing it to accommodate larger projects and better meet increasing private sector demand. As part of this expansion, INAF will receive new ultramodern chemical analysis and preclinical studies laboratory facilities, while consolidating research capacity in nutrigenomics. The acquisition of new cutting-edge equipment will also make it possible to update existing laboratories, including the one housing the dynamic gastrointestinal system simulator, and establish a real-time feed to INAF’s multimedia room. DMG Architecture, Genivar, and BPR were tasked with drawing up plans and estimates for what will be INAF’s second major construction project in ten years.
Lassonde Nutrition and Health Chair

On November 19, 2008, in the presence of numerous dignitaries, the Lassonde Chair on Nutrition and Health was officially launched, with major funding from A. Lassonde Inc. and NSERC, an investment totalling over $2 million. The Chair, held by Dr. Gale West, will contribute to the advancement of basic research and technology concerning the development of and trends in the fruit and vegetable beverage and juice markets as well as their impact on consumer health. It will foster multidisciplinary work by bringing together research and development and marketing researchers from A. Lassonde and Université Laval’s FSAA consumer sciences, food technology, and clinical nutrition researchers. The Chair will enable A. Lassonde to expand the fruit and vegetable beverage and juice markets by developing products with added value for health. Sylvie Turgeon is also leading a major project with this chair thanks to a collaborative research and development grant. A number of INAF researchers and students are working on a variety of projects initiated through this chair.

Pfizer Canada/CIHR Chair in the Pathogenesis of Insulin Resistance and Cardiovascular Diseases

INAF’s scientific director, André Marette, is the holder of this chair, which was launched September 4, 2008, at Université Laval. The Chair is set up in the cardiology unit of Laval Hospital and works to elucidate the mechanisms through which proinflammatory molecules secreted by adipose tissue cause diabetes and cardiovascular complications, in order to explore possible avenues for treatment, particularly functional and nutraceutical foods.

TRAINING

The powerful trend toward healthier eating has put pressure on businesses and government agencies, who are increasingly looking for young professionals trained in a multidisciplinary environment. INAF is therefore a highly sought-after educational environment for students wishing to pursue graduate studies. In 2008–2009, no fewer than 344 students carried out work under the direction of INAF members—about 5% more than in the previous two years.
TRANSFER

INAF members shared their know-how in a number of ways in 2008–2009. As always, the calendar featured numerous colloquia and seminars, including the 3rd INAF Student and Postdoctoral Researcher Symposium, the STELA Symposium, the Probiotics and Health International Symposium, the Health and Seafood Symposium, as well as several others described further on in this report. Disseminating knowledge to the general public continued on the same scale this year through the Chair on Nutrition and Cardiovascular Diseases and through participation in two major public events: the Health Fitness and Lifestyle Show at Place Laurier in Quebec City and Salon de l’Agriculture, de l’Alimentation et de la Consommation at the Expo-Cité Exhibition Centre.

Often, media involvement provides INAF members the best opportunity to share the essence and import of their work with the general public. In 2008–2009, some thirty INAF members found their work making headlines or put their knowledge to work analyzing news issues. Thanks to their expertise, INAF appeared in over 20 media outlets ranging from radio and television (Radio-Canada, TVA) to newspapers (Le Soleil, La Presse), magazines (L’Actualité, Québec Science, Découvrir), and Web media (PasseportSanté, Agence Science Pressé). Linda Saucier was among Université Laval’s ten most consulted experts by the media in 2008, in the aftermath of the listeriosis crisis involving Maple Leaf meat products and the cheese crisis that occurred shortly afterward.

National and International Collaborations

In Quebec, the appointment of Lucie Beaulieu to a professorial position at UQAR and the addition of three new affiliated members at the Marine Biotechnology Research Centre in Rimouski were the networking highlights for INAF in the marine products sector. An agreement being developed between INAF and MAPAQ will facilitate collaboration between INAF researchers and students and those of Centre technologique des produits aquatiques (CTPA) de Gaspé beginning in fall 2009. On the national level, collaboration has intensified significantly between INAF and Manitoba’s Richardson Centre for Functional Foods and Nutraceuticals, while a number of researchers have put together new pan-Canadian teams through an AFMNet funding program, among others. Internationally, promotional efforts are beginning to show definite networking and positioning effects. In addition to a joint Université Laval–University of Bordeaux plan to establish an international nutrition institute, numerous new collaborative projects initiated by INAF researchers received funding, allowing researchers to work with major groups in Brazil, Chile, Egypt, France (Lille and Nantes), Norway, and others.
By making it possible to design projects in either basic or applied research and to target or prioritize themes according to their potential benefits for a particular Quebec industry, INAF’s scientific programming has shown itself to be broad, dynamic, and adaptable. It is divided into three primary research themes and three interest groups.

### Research Chairs
INAF research is strongly supported by no fewer than ten research chairs whose work contributes markedly to scientific programming. Two of these chairs were officially launched in 2008–2009. Another chair that has been very active in recent years is the Lucie and André Chagnon Chair for the Advancement of an Integrated Approach to Prevention, directed by Sylvie Dodin. This chair came to an end in 2008.

- **Canada Research Chair in Lactic Culture Biotechnology for Dairy and Probiotic Industries**
  - **Holder:** Denis Roy, FSAA, Université Laval
- **Canada Research Chair in Protein, Biosystem, and Functional Food Physical Chemistry**
  - **Holder:** Muriel Subirade, FSAA, Université Laval
- **Canada Research Chair in Physical Activity, Nutrition, and Energy Balance**
  - **Holder:** Angelo Tremblay, FMED, Université Laval
- **Canada Research Chair in Nutrition, Functional Foods, and Cardiovascular Health**
  - **Holder:** Benoît Lamarche, FSAA, Université Laval
- **Canada Research Chair on Use of Dietary Fatty Acids and Cognitive Functions During Aging Process**
  - **Holder:** Stephen Cunnane, CDRV, Université de Sherbrooke
- **Chair in Human Nutrition, Lipidology, and Cardiovascular Disease Prevention**
  - **Holder:** Benoît Lamarche, FSAA, Université Laval
- **NSERC-Dairy Sector Industrial Research Chair in Cheese Technology and Type Characterization**
  - **Holder:** Denis Roy, FSAA, Université Laval
- **J.A. de Sève Research Chair in Nutrition**
  - **Holder:** Émile Levy, CHU Ste-Justine, Université de Montréal

### New Chairs in 2008–2009

- **Lassonde Chair for Nutrition and Health**
  - **Objectives:** Develop functional beverages based on fruit jciues, study consumers’ attitudes and understanding of functional jciues
  - **Holder:** Gale West, FSAA, Université Laval
- **Pfizer/CIHR Research Chair on the Pathogenesis of Insulin Resistance and Cardiovascular Disease**
  - **Objectives:** Elucidate the mechanisms through which proinflammatory proteins cause diabetes and cardiovascular complications; uncover new avenues of treatment
  - **Holder:** André Marette, FMED, Université Laval

### RESEARCH THEME 1
**Identification, characterization, and functionality of bioactive molecules**
- **Theme leader:** Ismail Fliss

### RESEARCH THEME 2
**Manufacturing processes, quality and stability of bioactive molecules**
- **Theme leader:** Laurent Bazinet

### RESEARCH THEME 3
**Bioessays, nutrition, and socioeconomic studies**
- **Theme leader:** André Marette

**Milk and dairy products group – Dairy Science and Technology Research (STELA Centre)**
- **Director:** Sylvie Turgeon

**Marine products interest group**
- **Theme leader:** Lucie Beaulieu

**Plant-derived products interest group**
- **Theme leader:** Dominique Michaud

Over the years, INAF research programming has evolved and led to regular increases in the number of projects, funding, and collaborative undertakings.
Scientific Productivity

In 2008–2009, INAF research involved 45 regular members and 23 associate members with funding of $14.1 million. To this were added operating grants from FQRNT and Université Laval’s research bureau, for a total INAF budget of $14.63 million in 2008–2009.

Research Investments Between June 1, 2008, and May 31, 2009

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grants – team projects</td>
<td>$7.49 million</td>
</tr>
<tr>
<td>Grants – individual projects</td>
<td>$2.37 million</td>
</tr>
<tr>
<td>Research chairs</td>
<td>$2.10 million</td>
</tr>
<tr>
<td>Equipment and facilities</td>
<td>$1.18 million*</td>
</tr>
<tr>
<td>Contracts</td>
<td>$0.94 million</td>
</tr>
<tr>
<td>Operations</td>
<td>$0.55 million</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$14.63 million</strong></td>
</tr>
</tbody>
</table>

* Amount does not include $8.1 million infrastructure grant for expansion. This funding will be principally applied in the coming year.

Sixty-four of the 108 team projects involved two or more INAF members, the other team projects involving nonmember collaborators. INAF members’ work was reported in no fewer than 187 publications, of which 38 were co-authored by at least two INAF member researchers, and 88 of which were lead-authored by an INAF student.

Principal Funding Sources for Research Projects*

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSERC</td>
<td>$2.0 M</td>
</tr>
<tr>
<td>CIHR</td>
<td>$4.5 M</td>
</tr>
<tr>
<td>CFI</td>
<td>$0.8 M</td>
</tr>
<tr>
<td>FQRNT - FRSQ</td>
<td>$0.9 M</td>
</tr>
<tr>
<td>Federal government – Other departments and agencies</td>
<td>$0.4 M</td>
</tr>
<tr>
<td>Provincial government – Other ministries and agencies</td>
<td>$1.1 M</td>
</tr>
<tr>
<td>Foundations and associations</td>
<td>$0.5 M</td>
</tr>
<tr>
<td>Other sources</td>
<td>$0.8 M</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$11.0 M</strong></td>
</tr>
</tbody>
</table>

* Excludes operations, chairs, and contracts.

STELA 2008-2009 Research Budget*

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual grants</td>
<td>$480 720</td>
</tr>
<tr>
<td>Team grants and NSERC industry chair</td>
<td>$2 235 490</td>
</tr>
<tr>
<td>Facilities and equipment</td>
<td>$133 510</td>
</tr>
<tr>
<td>Contracts</td>
<td>$226 100</td>
</tr>
<tr>
<td>Canada research chairs</td>
<td>$425 000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$3 500 820</strong></td>
</tr>
</tbody>
</table>

* These amounts are included in the INAF summary above.

Inside INAF, milk and dairy product research is based on expertise developed over more than 20 years by the Dairy Science and Technology Research Centre (STELA). Directed by Sylvie Turgeon, STELA boasts 16 regular researchers, 8 associate researchers, some 20 collaborators, and close to 70 graduate students. Its research budget in 2008–2009 was over $3.5 million, of which two-thirds came from multidisciplinary team research projects and an industrial research chair. In this type of project, industry contributes over 30% of research funding through cooperative, strategic, or joint-action projects.
Cultivating Growth...

With over half of all research projects carried out by a team, the multidisciplinary character of INAF’s work is no longer an end in itself. It has become a new way of conceiving projects and undoubtedly a key to their success. Although some projects focus more on technology and others on health, projects straddling basic sciences, engineering, and health sciences have become INAF’s signature. The following pages introduce some of the research themes that have engaged INAF researchers over the course of the year.

Probiotics


With a Canada Research Chair and specialists in microbiology, molecular biology, nutrition, immunity, and food technology, research on lactic acid bacteria and probiotics is a pillar of INAF’s functional foods leadership. Researchers study the bacteria themselves as well as their metabolism, what they become in food, and their effects on the human body. Here is a sample of the projects carried out on these subjects in 2008–2009:

- Study of exopolysaccharide biosynthesis in lactic acid and probiotic bacteria and their degradation by probiotics for various uses
- Prebiotic potential of dairy CLAs: in vitro analysis and effects on the gastrointestinal ecosystem
- Understanding the role of exopolysaccharides in acidic dairy products in order to optimize their use
- Validating viability conditions of probiotics in dairy products: new approaches based on metabolic characteristics, abundance, and relative activity
- A multidisciplinary approach to studying and understanding the interactions between bacteriocinogenic probiotics and the digestive ecosystem

Health, A Driving Force for Engineering Research


When food science and technology are combined with food engineering to improve health, the result is high tech projects to develop new methods that benefit not only the agrifood industry, but also the pharmaceutical industry and even the environment! Here are a few projects from 2008–2009:

- Membrane processes for the purification of milk peptides
- Study of protein- and polysaccharide-based mixed gel systems
- Development of protein excipients for the controlled release of active molecules
- Lactobionic acid production by chemocatalytic synthesis from partially deproteinated whey powder
- Development of bioactive coatings and packaging
- Recovery of recycled food oils for use in bioplastics

Good Fats, Bad Fats


Good fats that benefit health, such as conjugated linoleic acids (CLAs) and omega 3 fatty acids, as well as bad fats, such as trans fats and the byproducts of heat-degraded cooking oils, both reveal their secrets under the watchful eyes of INAF researchers. Here are some of the themes examined in 2008–2009:

- Development of a vegetable oil hydrogenation method to minimize trans fat content and promote the presence of CLAs
- Study of the degradation of fatty acids into toxic byproducts during cooking
- Production of CLA and vaccenic acid–enriched milk fat–based ingredients
- The human health potential of CLA as a nutraceutical ingredient
- The impact of natural trans fatty acids on cardiovascular disease risk factors in women
Quebec’s White Gold


From the study of dairy cow diets to the microorganisms that populate Camembert rind, a multitude of projects are looking into milk’s composition and nutritional value, the bioactive components it contains, milk processing, and cheese technology. For more than 20 years, STELA has been the heart and soul of dairy research and the top project host and partner for Quebec’s dairy industry. Here are some of the research themes explored by STELA in 2008–2009:

Dairy Technology
• Study of the technological and microbiological characteristics of land milks
• Structuring properties of milk proteins in dairy products and processed foods
• Bovine milk growth factors: extraction, characterization, and biological activities
• Development of an integrated approach for the recovery of buttermilk solids
• Biological activities of minor buttermilk and whey components

Cheese Technology
• Development of health-promoting cheeses containing a bioactive compound (GABA)
• Flavouring starter culture to improve the flavour of fresh cheddar curds and rounds and reduce post-acidification
• Geotrichum candidum biodiversity and its involvement in the typicity of Canadian cheeses
• Integration of bioactive components to rennet curds: impact on yield, biological activity, physiochemical and sensory properties of cheese

Danger Ahead!


With the listeriosis crisis of 2008, the food safety research of several INAF researchers has been more than ever in the public eye. This research theme, which had been emerging at INAF for a few years, really took off in 2007 and is expected to grow significantly in the coming years. Here are a few of the major themes covered in this work:

• Natural antimicrobials and new strategies for ensuring meat safety and wholesomeness
• Study of enteric virus attachment and transmission to surfaces and foods and methods for inactivation
• Lactic acid–derived bacteriocins: a promising alternative in the battle against antibiotic-resistant bacteria
• Technologies for extracting and purifying natural antimicrobial protein molecules through electrodialysis using ultrafiltration membranes for the replacement of synthetic food additives in meat products
• Exploiting the antibacterial and antifungal activity of whey protein hydrolysates
Beyond Fruits and Vegetables


The plant kingdom is undoubtedly the most prolific source of compounds beneficial to human health. Fruits and vegetables have always been big news at INAF, but today they have been put to new uses. Cereal grains, tea, chocolate, soy, seaweed, and even some forest products have fallen under researchers’ indefatigable eyes. Here are a few examples:

- Post-harvest handling and levels of beneficial compounds in fruits and vegetables
- Development of novel health-promoting foods from the Quebec vegetable industry
- Study of bioactive compounds from red maple and other tree species
- Production of a symbiotic maple beverage
- Oat beta-glucans, cranberry polyphenols, and blood cholesterol

Cultivating Growth...

An Ocean of New Possibilities


If any resource remains under-utilized in the functional foods and nutraceuticals sector, it would be the ocean and all it contains. Other than the marked interest in omega-3 fatty acids in recent years, major efforts are under way to uncover all the potential of this rich and abundant biomass. Here are some such projects from last year:

- Polysaccharides and bioactive derivatives of an indigenous brown seaweed
- Screening and recovery of hemocyanin from snow crab byproducts
- Fractionation of mackerel oil to produce fractions rich in saturated, monounsaturated, and polyunsaturated fatty acids
- Use of marine proteins in the prevention of obesity, diabetes, and cardiovascular diseases
- Study of the biosynthesis of a marine exopolysaccharide with benefits for human health

The Infernal Triangle


From a food standpoint, the close links between obesity, diabetes, and cardiovascular diseases demand a multidisciplinary research approach, both to understand risk factors and to develop preventative methods. With a research team encompassing specialists in nutrition, physiology, pharmacology, and medicine, INAF works to fight these plagues through basic and applied research. Here are some of the themes being studied:

- Functional foods: a potential solution for satiety management
- Hormonal metabolism and stress in metabolic syndrome pathogenesis
- Pathogenesis, prevention, and treatment of insulin resistance
- Identification of cellular and molecular mechanisms involved in cardiovascular disease formation
- Characterization and understanding of nutritional interventions involving human oxidative stress, inflammation, and endothelial stress
Healthy Aging Through Healthy Eating

F. Calon, S. Cunnane, E. Dewailly, S. Dodin, A. Khalil, C. Ramassamy

It is a well-known fact that the population is aging. Therefore, it comes as no surprise that age-related illness is becoming more widespread. Unsurprising as it is, age-related illness doesn’t have to be a fact of life.

Knowledge about health and the prevention of age-related neurodegenerative diseases through functional foods and nutraceuticals is the subject of several research projects being carried out by INAF researchers. Here are a few:

• Aging, oxidative stress, and atherosclerotic processes
• Effects of antioxidant-rich functional foods during aging
• Effect of omega-3 fatty acids on cognitive faculties and the prevention of Alzheimer’s and Parkinson’s disease

Cause and Effect, and Vice Versa


Do foods switch genes on and off? Do genes decide what the body will do with foods? It’s all part of the fascinating world of nutrigenomics—describing the subtle interactions between genes, genetic variation, the absorption of nutrients, and the predisposition to certain diseases. This field of research will see major development in the future. Here are some of the topics studied in 2008–2009:

• Genes, eating behaviours, and their role in the development of obesity
• Effect of PPAR-alpha-L162V polymorphism on the metabolic response to omega-3 fatty acid supplementation
• Creation of a functional food for treatment of obesity and Type 2 diabetes through a personalized nutrigenomic approach

Studies Conducted at the Clinical Nutrition Investigation Unit in 2008–2009

• The Mediterranean diet and its impact on human metabolic syndrome
• The Mediterranean diet, blood cholesterol, and other risk factors for cardiovascular disease
• Functional foods and the immune system
• Atorvastatin and intestinal expression of the NPC1L1 gene in hypercholesterolemic subjects
• Berry beverages and athletic performance
• Tea and chocolate consumption and endothelial function
• The Portfolio diet and reduction of cholesterol levels
• High- or low-fat diet versus intestinal expression of genes involved in cholesterol metabolism
• Fish nutrients, metabolic syndrome, and insulin resistance
• Soluble oat fibre and blood cholesterol
• Sitagliptin and postprandial lipid levels in diabetic subjects
• Omega 3 supplementation and intestinal lipid metabolism in subjects with Type 2 diabetes
• The validity and reliability of an Internet-administered food frequency questionnaire
Businesses, ministries, and public and parapublic research centres operating in the agrifood and healthcare industries presently have an urgent need for highly qualified and versatile staff to transfer new knowledge, meet the many challenges of these evolving sectors, and develop new lines of nutraceuticals and functional foods. With such excellent employment prospects, INAF is a training environment highly prized by students wishing to pursue graduate studies.

While there are evidently numerous graduates in nutrition and food science and technology who wish to join the ranks of INAF at the graduate level, our work also appeals to graduates from a number of other programs related to the faculties of agriculture, medicine, pharmacy, science, and engineering. The scientific activity program which includes seminars, symposiums, and technology conferences offered by INAF are opportunities for young researchers to broaden their training by acquiring knowledge that goes beyond the scope of their individual research projects. In 2008–2009 the majority of student and postdoctoral researchers supervised by INAF members were registered in the following programs:

- Agricultural Microbiology
- Agrifood Economics
- Agrifood Engineering
- Animal Science
- Biochemistry
- Epidemiology
- Experimental Medicine
- Food Science and Technology
- Kinesiology
- Microbiology
- Nutrition
- Pharmacy
- Pharmacology
- Physiology/Endocrinology
- Plant Science
- Wood and Forest Science

Graduate students trained at INAF make up a talent pool highly sought after by employers

### Distribution of INAF students according to 2008–2009 study levels

<table>
<thead>
<tr>
<th></th>
<th>Master</th>
<th>Doctorate</th>
<th>Postdoctoral Training</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNDER WAY</strong></td>
<td>73</td>
<td>99</td>
<td>24</td>
</tr>
<tr>
<td>Students who were registered on June 1, 2008, and had not graduated as of May 31, 2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NEW</strong></td>
<td>36</td>
<td>25</td>
<td>8</td>
</tr>
<tr>
<td>Students who registered after June 1, 2008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GRADUATES</strong></td>
<td>48</td>
<td>20</td>
<td>11</td>
</tr>
<tr>
<td>Students who graduated before May 31, 2009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>157</td>
<td>144</td>
<td>43</td>
</tr>
</tbody>
</table>

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- Epidemiology
- Experimental Medicine
- Food Science and Technology
- Kinesiology
- Microbiology
- Nutrition
- Pharmacy
- Pharmacology
- Physiology/Endocrinology
- Plant Science
- Wood and Forest Science

**Mélanie BOUSQUET**, doctoral candidate, earned a prestigious CIHR Vanier Canada Graduate Scholarship providing $50,000 per year for three years for her work on the impact of omega 3 fatty acids in neuroprotective strategies for Parkinson’s disease in animal models. Her work is supervised by Dr. Frédéric Calon (INAF member) of the Faculty of Pharmacy and Dr. Francesca Cicchetti of the Faculty of Medicine.

**Éric Andriamahery RASOLOFO** completed his doctoral studies in microbiology in 2009 under the direction of Denis Roy of the Faculty of Agricultural and Food Sciences (INAF member). Eric was hired as director of research and development at Kéfiplant, an innovative SME in the Drummondville area that commercializes fermented plant extracts for human health, cosmetics, and animal nutrition.
Third INAF Student and Postdoctoral Researcher Symposium a resounding success

March 19 and 20, 2009, Levis’ Convention and exhibition centre

For the third time since 2005, INAF student and postdoctoral researchers planned a high quality event. Under the theme PRENDRE SON ENVOL (Taking Off), the symposium helped convey the quality and diversity of the research projects conducted at INAF to 150 participants and create a forum for discussion and interaction between students and industry. Student researchers presented 14 oral briefings and over 25 posters covering all INAF research areas and themes. Nine guest speakers occupying key positions in business, including Solange Doré (Lassonde Industries), Michel Pouliot (Agropur), Barbara Winters (Campbell Soup Co.), and several others, some formerly of INAF, presented their vision for development of and prospects for the nutraceutical and functional food market. They also highlighted the qualities and skills they had developed during their careers, which are assets for young researchers on the verge of entering the labour market. The event was sponsored by Association for Health Ingredients in Foods and made possible thanks to the financial support of FQRNT and MAPAQ.

Making access to the labour market easier for student researchers: programs and tools

A brand new event this year featured the presentation of programs that make it easier to hire young science and technology professionals. Finding work… Is this not what all students aspire to? Although most finesse it brilliantly, few are aware of the tools available to make the task easier. Three INAF partners representing the National Research Council of Canada, FQRNT and CQVB came to discuss this decisive theme. This activity—the first of its kind at INAF—was greatly appreciated and will be revised and enhanced for next year.

Learning in all kinds of ways

Youth mentorship as part of the Bell Science Fair is on the point of becoming a tradition at INAF. In 2009 two doctoral candidates in food science and technology went through this highly educational coaching experience. Amélie Desmarais supervised David Boivin and Viviane Vallerand of Séminaire des Pères Maristes de Québec, whose presentation on French fries and fate earned seventh place at the regional finals and the Chemistry Coup de Coeur Award at the provincial finals. Marie-Hélène Lessard was extremely proud to learn of the quick success earned by her young “protégé,” Alexandre Lemieux of Externat Saint-Jean-Eudes. The grade 10 student carried out his project, entitled Cheese, an ecosystem!, in Steve Labrie’s laboratory. In addition to earning three awards at the regional finals—including the Agrifood Coup de Coeur Award—he won the silver medal and two bursaries at the Canadian finals.
INAF is involved in knowledge transfer activities that truly reach research users

Whether for scientific clienteles, healthcare or industry professionals, or the general public, knowledge transfer activities help reach the users of research results. Year after year, INAF brands every event in which it participates with its seal of quality as both leading organizer and partner.

The biennial STELA Symposium was held in May 2009 under the theme “Beyond Frontiers of Dairy Science.” The scientific and industrial communities, which faithfully attend this event, learned about the promising research work of STELA Centre graduate students and listened to prestigious speakers such as Dr. Bernard Mietton (Poligny, France), who addressed a very current topic: reconciling traditional cheesemaking practices with modern safety and wholesomeness requirements. Researchers Stuart Phillips of McMaster University in Ontario (opposite) and David Barbano of Cornell University subsequently generated great interest by presenting, respectively, the beneficial role of milk proteins in postexercise muscle anabolism among athletes and the latest advances in microfiltration of milk proteins for applications in the fast-growing nutraceutical beverage industry. In addition to the STELA Symposium, a specialized cheese technology training session was held. Mr. Bernard Mietton, who has over 30 years’ experience in France’s cheesemaking business, shared his practical and technical knowledge with Quebec cheesemakers eager to learn this unique expertise. Participants learned a great deal about critical monitoring points such as milk quality, production conditions, and the maturation environment of their cheeses. All were provided with specific reference points for improving their individual practices. This training session was greatly appreciated and will definitely be repeated in the near future.

Canada Research Chair in Nutrition, Functional Foods, and Cardiovascular Health

A number of activities designed for the general public and healthcare professionals were organized by the Canada Research Chair in Nutrition, Functional Foods, and Cardiovascular Health in 2008–2009. Cardiovascular Disease and Obesity Training Day, held on June 6, 2008, was aimed at nutritionists and healthcare professionals and designed to improve scientific knowledge and practices in the prevention of cardiovascular disease, obesity, and its complications. A number of talks were presented as part of Nutrition Month or special thematic activities, notably to professionals at hospitals and student groups (undergraduates in nutrition and food science and technology, college students in natural science). Activities for the general public consisted of free talks and the presence of INAF nutritionists at a number of major events, such as Expo-Québec and the Health Fitness and Lifestyle Show presented at Place Laurier in January 2009.
Probiotics and Health International Symposium: “Cross Talk Now!”

International Symposium “Cross Talk Now!” has unquestionably become a focal event of INITIA, formerly the Governors Foundation. The biennial event, held in Quebec City for the first time since its inception, was a tremendous, hands-down success. The Quebec City Convention Centre was the ideal setting for meetings and discussions between the 300 participants gathered to update their knowledge and applications of the most documented probiotics and prebiotics and explore new research concerning their links to chronic diseases, etc. INAF is a long-standing partner of the Symposium, thanks mainly to close collaboration between INITIA and the Canada Research Chair in Lactic Culture Biotechnology for Dairy and Probiotic Industries, headed by Denis Roy.

Health & Seafood Symposium

The first-ever Health & Seafood Symposium gathered together over 240 participants involved in research, the fishing and seafood processing industry, development, healthcare, marine biotechnology, and other areas. This unique event combined a day of talks in plain language on nutrition, markets, and research innovations with a casual, fun evening of discovering simple and original ways to eat more seafood thanks to the participation of well-known television and radio personalities and Quebec minister Laurent Lessard. The event was organized by the Quebec Fisheries Roundtable and Quebec Fish Processors Association, with the help of a committee consisting of representatives of MAPAQ, INAF, Agriculture and Agri-Food Canada, Centre québécois de valorisation des biotechnologies, and the Marine Biotechnology Research Centre.

The Health & Seafood Symposium was hosted brilliantly by Ms. Hélène Raymond, journalist for the Radio-Canada show La Semaine Verte.

Nutra-Innovation: A Lasting Partnership

Since 2001 INAF has been collaborating with Centre québécois de valorisation des biotechnologies (CQVB) on activities and publications designed to stimulate discussion between sector researchers and manufacturers. The presentations produced as part of technology meetings as well as information documents are available on the CQVB website (www.cqvb.qc.ca).
Collaborations and Partnerships

Significant partner involvement bears witness to INAF’s rootedness in the community, its credibility, and its relevance

Whether specialized research centres or networks, small or large private companies, or big organizations such as ministries, associations, federations, and development agencies, the many collaborators and partners of INAF are essential to its development and evolution. Partners take a very concrete view of our work and initiatives, thereby keeping INAF on the lookout for community needs and opportunities for development. Here are a few examples of partnership projects carried out in 2008–2009 in INAF’s various fields of expertise.

Probiotics Case Study
A case study was conducted in order to develop practical recommendations for Health Canada on standards of proof and approaches that would help integrate function claims for products containing probiotics. The study, funded by the Dairy Processors Association of Canada and Nutri-Net Canada, was conducted jointly by INAF, Association for Health Ingredients in Foods, and the firm Tonic. The document was published in fall 2008.

New Functional Bread
Saint-Méthode Bakery, a Quebec company that has been well-established for over 60 years, set a goal to become the leader in healthy bakery products in Eastern Canada. By choosing to work with INAF to develop its new line of breads carrying health claims, the company enjoys step-by-step guidance that included not only scientific analysis, but also regulation and innovation strategies.

“Trendy” Fruits and Vegetables
Founded in 2008, Nutra Canada is a Quebec company whose innovative extraction process was developed in collaboration with INAF, the National Research Council of Canada, and private partners. The process is used to extract active ingredients and process medicinal plants, fruits, and vegetables. The company is partner in a number of research projects in collaboration with INAF.

innoVactiv
For a number of years, the Rimouski company innoVactiv Inc. (formerly Les Biotechnologies Océanova) has been partner in an NSERC Collaborative Research and Development grant, which helped the company study the nutraceutical and cosmeceutical potential of certain molecules of a brown algae native to Quebec. The project helped develop innovative applications that were patented, and train two graduate students.

So pink, so plump, so delicious!
Both informative and appetizing, the Discover the unique taste of cold water shrimp leaflet was produced by INAF for the Quebec Fish Processors Association in collaboration with Centre Fierbourg, the Marine Biotechnology Research Centre, and Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec.
Whether for research partnerships, analytical service contracts, molecule screening, clinical studies, or advice on developing health claims, the greater INAF network opens the door to diversified expertise. In 2008–2009, the following partners contributed in cash or kind to research projects in collaboration with INAF researchers or key communication and transfer activities.

INAF Partners

- Abbott Nutrition
- Advanced Foods and Materials Network
- Advitech
- AgBioCentre
- Agropur coopérative
- Ameridia
- Association for Health Ingredients in Foods
- Atrium Innovation
- Axcan Pharma
- Barry Callebaut
- Bellus Santé
- BioMérieux
- Biopharmacopée Design International
- BioSerie Laboratoires
- Biscuits Leclerc
- Bonduelle Canada
- Caldwell BioFermentation Canada
- Campbell Soup Co.
- Canadian Dairy Commission
- Canadian Meat Council
- Cascades
- Centre de développement bioalimentaire
- Centre de recherche en acériculture
- Centre de recherche Les Buissons
- Centre d’expertise en analyse environnementale du Québec
- Centre d’expertise sur les produits agroforestiers
- Centre Fierbourg
- Centre québécois de valorisation des biotechnologies
- Centre technologique des produits aquatiques
- Chocolat Broma (Vignault chocolatiers)
- Cintech Agroalimentaire
- CIRANO
- Consortium Aliments santé de la région métropolitaine de Québec
- Consumer and Market Demand Network
- Coopérative Fédérée de Québec
- Copalis
- CREA Nutrition AG
- Dairy Farmers of Canada
- Dairy Processors’ Association of Canada
- Damafro
- DNP Canada
- Eurodia
- Exploitation agricole G.B.
- Fédération de patinage de vitesse du Québec
- Fédération des producteurs acéricoles du Québec
- Fédération des producteurs de lait du Québec
- Fédération des producteurs de porcs du Québec
- Ferme J.C. Lachance et fils
- Fromagerie Bolvin
- Fromagerie du littoral
- Fromagerie Polyethnique
- Fruits d’Or
- Fumoir Grizzly
- Glycemic Index Laboratories
- Groupe Gosselin Productions FG
- Health Canada
- HET
- Hormonal Sciences
- Immunotec
- INITIA
- innoVactiv
- Institut Rosell
- International Dairy Federation
- Kefiplant
- Kraft
- La Maison Bergevin
- Lassonde Industries
- Le petit Mas
- Les Délices de la nature
- Les fermes Rivest Bourgeois
- Les Fraises de l’île d’Orléans
- Les Laboratoires Nutri Santé
- Les Productions MarGiric
- MAPAQ
- Marinova
- Maxi-Plant
- McCormick
- MDDEP
- MDEIE
- Medicago
- Merck Frosst Schering
- MRI
- NIFES
- NOFIMA
- Norland
- Novalait
- NRC
- Nutra Canada
- Nutri-Net Canada
- Ocean Nutrition Canada
- Onipro
- Parmalat Canada
- Passeport Santé
- Pfizer Canada
- PharmAfrican
- PharmaLab
- Pôle Québec-Chaudière-Appalaches
- Premier Tech
- Provigo
- Pulse Canada
- PurGenesis
- Quebec Fish Processors’ Association
- Quebec Seabuckthorn Growers’ Association
- Radio-Canada L’Épicerie
- Richardson Centre for Functional Foods and Nutraceuticals
- Royal Bank of Canada
- Saputo
- Speed skating Canada
- St-Méthode Bakery
- Table des pêches maritimes du Québec
- Tetrapak Canada
- Theobroma
- Tonic
- Ultima Foods
- Valacta
- Vert Nature

A list of abbreviations appears on page 20.
The Board of Directors meets four times per year and provides the Institute with the guidance and direction necessary to achieve its development goals and meet the objectives identified in the 2006–2011 Strategic Plan.

Executive Committee and Board of Directors 2008-2009

The Board of Directors meets four times per year and provides the Institute with the guidance and direction necessary to achieve its development goals and meet the objectives identified in the 2006–2011 Strategic Plan.

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Plant Products
Group Leader

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ALN-UL

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Jacques-André ST-PIERRE
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## Abbreviations

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<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AAFC</td>
<td>Agriculture and Agri-Food Canada</td>
</tr>
<tr>
<td>AHIF</td>
<td>Association for Health Ingredients in Food</td>
</tr>
<tr>
<td>ALN</td>
<td>Department of Food Science and Nutrition</td>
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<tr>
<td>CDRV</td>
<td>Research Centre on Aging, Université de Sherbrooke</td>
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<tr>
<td>CFI</td>
<td>Canada Foundation for Innovation</td>
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<td>CHUQ</td>
<td>Quebec University Hospital Centre</td>
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<td>CHRI</td>
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<td>CIU</td>
<td>Clinical Investigation Unit</td>
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<tr>
<td>CGVB</td>
<td>Centre québécois de valorisation des biotechnologies</td>
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<tr>
<td>CRBR</td>
<td>Reproductive Biology Research Centre</td>
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<td>CRHI</td>
<td>Horticulture Research Centre</td>
</tr>
<tr>
<td>CTAPA</td>
<td>Aquatic Products Technology Centre (MAPAQ)</td>
</tr>
<tr>
<td>DFC</td>
<td>Dairy Farmers of Canada</td>
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<td>DSRDC</td>
<td>Dairy and Swine Research and Development Centre (AAFC)</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>FFG</td>
<td>Faculty of Forestry and Geomatics</td>
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<tr>
<td>FMED</td>
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<td>FPHA</td>
<td>Faculty of Pharmacy</td>
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<tr>
<td>FQRNT</td>
<td>Fonds québécois de recherche sur la nature et les technologies</td>
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<td>FRDC</td>
<td>Food Research and Development Centre (AAFC)</td>
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<tr>
<td>FRSQ</td>
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<td>FSAA</td>
<td>Faculty of Agriculture and Food Science</td>
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<td>HPQ</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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<td>MAPAQ</td>
<td>Quebec Ministry of Agriculture, Fisheries and Food</td>
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<td>MBRC</td>
<td>Marine Biotechnology Research Centre</td>
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<td>MDDEP</td>
<td>Quebec Ministry of Sustainable Development, Environment and Parks</td>
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<td>MELS</td>
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<td>MRII</td>
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<td>NIFES</td>
<td>National Institute of Nutrition and Seafood Research (Norway)</td>
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<td>National Research Council of Canada</td>
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<td>NSERc</td>
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<td>PHY</td>
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<td>STELA Dairy Research Centre</td>
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<td>UL</td>
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<tr>
<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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Science enhancing nutrition

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