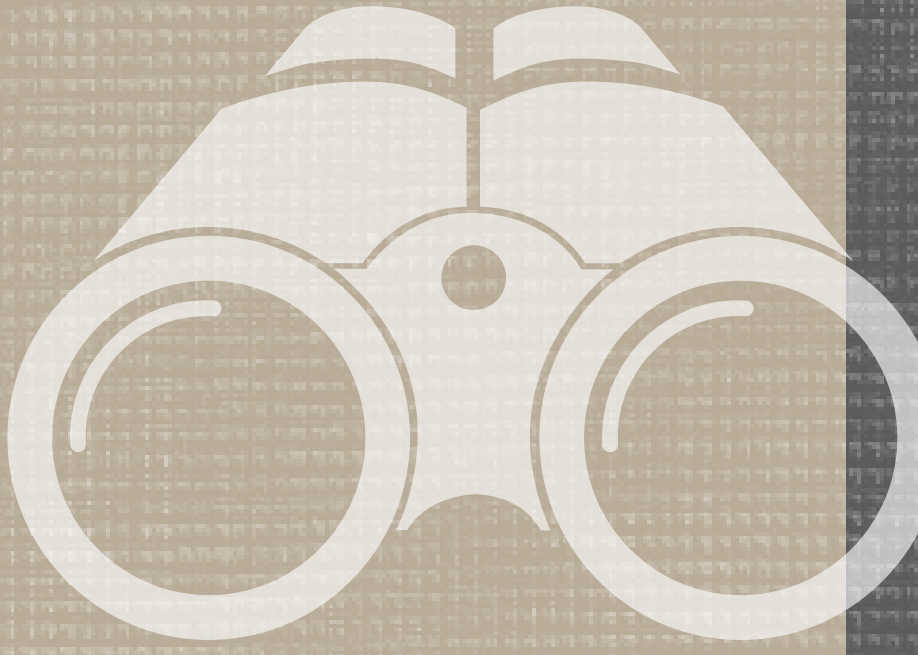
2014 ACTIVITY REPORT

CURRENT PLANNING FOR FUTURE PREVENTION

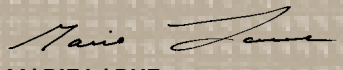


Institut de recherche
Robert-Sauvé en santé
et en sécurité du travail

I declare that I have every reason to believe that the observable facts and measurable data presented in this activity report reflect the situation as at December 31, 2014. This information falls under my responsibility as president and CEO of the Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST). I hereby attest to its accuracy and the rigour of the controls relating thereto.

The indicators retained are developed using reliable and accurate data and allow us to assess the IRSST's production over the course of the year.

Recommended by the members of the IRSST's Scientific Advisory Board and approved by its Board of Directors, the 2014 activity report faithfully describes the Institute's mission, vision, and principal achievements.



MARIE LARUE
President and CEO

TABLE OF CONTENTS

MESSAGE FROM **THE PRESIDENT AND CEO**

2014 was a milestone year marked by the ongoing implementation of the five-year scientific and technical production plan, consolidation of our project-management processes, and continued smooth running of our routine activities, as we sought to accomplish our mission.

Among other things, the year saw the dividing up of the five-year plan into annual action plans. Each research field, division, and department was assigned tasks and activities that will allow its personnel to contribute in their own ways to the implementation of the five-year plan, which essentially maps out our trajectories through to 2017.

Behind the scenes, the Institute stepped up its human resource planning efforts to offset the effects of an aging workforce and slow the draining of the scientific talent pool. This pool represents the resources on which the IRSST's future hinges. The challenge of timely staffing is so critical that it permeated this activity report and inspired its theme: Current Planning for Future Prevention. The main efforts made in this regard over the past few years are summarized in this annual retrospective report to show that this issue facing the scientific community is receiving all the attention it warrants.

Also in the background, the implementation of the improved research-project management process entered a new phase in 2014. We can now calmly look forward to achieving our objective of ensuring quality scientific and technical production, organizational efficiency and coherence, and process optimization, with regard to both resource allocation and meeting deadlines.

In addition to supporting Québec's prevention network in its needs for analysis and expertise, the Laboratory Division devoted time and energy to its goal of acquiring a transmission electron microscope and planning all that would be required to install such an instrument on our premises. The availability of this state-of-the-art equipment could have positive impacts in terms of retaining current staff and attracting new scientists. This major acquisition project strengthened the reference role of our laboratories and was approved by the Board of Directors, whose questions helped substantiate the matter and allow for informed decision making.

AMONG OTHER THINGS, THE YEAR SAW THE DIVIDING UP OF THE FIVE-YEAR PLAN INTO ANNUAL ACTION PLANS.

At the institutional level, the year was distinguished by the renewal of our cooperation agreement with France's Institut national de recherche et de sécurité pour la prévention des accidents du travail et des maladies professionnelles (INRS-France) and by the signing of a memorandum of understanding with the U.S. National Institute for Occupational Safety and Health (NIOSH), which points to a promising future of expertise sharing, jointly conducted research activities, and occupational health and safety (OHS) knowledge transfer. Given the close links between our two economies, the similarity of our industrial activity structures, and even the similarities between

Québec's injury profiles and those of the United States, we share a number of common issues and scientific challenges in the area of OHS.

Lastly, 2014 was also an exceptional year in terms of expertise. Great efforts were made to address requests from our partners, mainly the Commission de la santé et de la sécurité du travail (CSST). It expressed needs for knowledge, especially regarding quantification and preventive measures pertaining to mineral fibres and the selection of appropriate protective equipment for preventing the transmission of potentially dangerous viruses. This is another aspect of the IRSST's mission that allows the Institute and its personnel to demonstrate their usefulness yet again—and specifically the Institute's role as a scientific reference and expertise centre—by responding to our partners' requests with all the rigour that the word scientific implies. We are committed to achieving this mission—which is to contribute, through research, to the prevention of industrial accidents and occupational diseases and to the rehabilitation of affected workers—year in and year out, and with full adherence to the scientific protocols and rules of ethical conduct specific to research.

It is a mission we are proud of.

I can vouch for that.

Marie Larue

2014 IN NUMBERS

PRODUCTION

185 active projects and activities
- 38 projects being developed
- 35 projects began (22 joint, 5 external, and 8 internal)
- 30 completed projects
- 82 projects in progress.

212 partner organizations from the OHS network were involved in active projects.

119 new requests for expertise were received.

47 external committees included at least one IRSST representative:
- 12 committees of the CSST and its network, including regulatory committees
- 13 national and international standards committees
- 22 other local, national, and international committees.

35 scholarships were awarded, for a total of $395,685.

201 external researchers from 22 universities and 27 research centres formed part of the IRSST's network of scientific research collaborators.

OUTREACH

PUBLICATIONS AND COMMUNICATIONS

60 publications

57 research reports, technical fact sheets, and guides published by the IRSST

3 documents published in collaboration with partners.

71 peer-reviewed scientific publications related to projects carried out or funded by the IRSST:

50 journal articles

13 articles published in conference proceedings

8 other publications, such as book chapters and Master's and doctoral theses.

39 new online videos on irsst.tv.

143 other presentations given by IRSST personnel or IRSST-funded researchers at scientific conferences or events organized by partners.

27 simplified articles in *Prévention au travail*, the magazine published by the CSST and the IRSST.

96,616 downloads of publications disseminated on the IRSST's Web sites.

388,756 sessions on the IRSST's Web sites.

4,909 subscribers to *InfoIRSST*, the Institute's electronic newsletter.

LABORATORY PRODUCTION

74,728 environmental, toxicological, and microbiological analyses were performed, including 71% for partners in the prevention-inspection network: the CSST, local health and social services network development agencies, and joint sector-based associations. Our laboratories reported a 1% increase in the total number of analyses performed compared to 2013.

8,474 hours were spent on the calibration, maintenance, and repair of direct-reading and sampling instruments, of which 73% were for the OHS and prevention-inspection network. This number represents a decrease of 1.7% from the previous year.

WORKFORCE **PLANNING**

When it comes to filling research needs that demand specific expertise and scientific knowledge, recruitment requires patience and tenacity because it is necessarily an ongoing process. It is sometimes even entrusted to specialized firms.

The governance of a knowledge centre invariably requires having an eye to the future. A knowledge centre is obliged not only to anticipate emerging problems now so that workplaces can start basing their preventive actions on solid knowledge, but to anticipate its own future needs for new scientific and technical talent so that it can meet its clients' and partners' expectations.

Now entering its 35th year, the IRSST has for some time already been anticipating a loss of (sometimes unique) expertise that goes hand-in-hand with the retirement of specialized human resources. Many of these individuals have been with the Institute since its founding. In addition to a workforce management plan focussed on reassessing vacated positions and on allocating resources to areas where new needs are being felt, our administrators are taking other measures and starting to benefit from those already put in place to respond more effectively to the challenges posed by these first waves of retirement.

SCHOLARSHIP AND FELLOWSHIP PROGRAM

Created in 1981, the Graduate Studies Scholarship and Postdoctoral Fellowship Program in Occupational Health and Safety is the key strategy for attracting a new generation of scientists. As many as 466 students have been encouraged over the years to embark on careers as OHS researchers.

An evaluation performed in 2005 revealed a substantial retention rate, with two-thirds of our former scholarship recipients still active in the OHS field and one-third of these directly involved in research.

INSTITUTIONAL GOAL:

TO HELP REPLENISH THE INTERNAL AND EXTERNAL POOLS OF NEW RESEARCH TALENT IN THE AREA OF OCCUPATIONAL HEALTH AND SAFETY

In 2013, the Institute determined that since the beginning of the program, 524 IRSST studies (representing nearly 40% of the total number) had at least one of our scholarship recipients on their team. Twelve recipients, including 10 researchers, are now part of the IRSST's personnel. In addition, the program provides a way of distributing the scholarships and fellowships among recipients according to our partners' needs by prioritizing research disciplines where needs are being felt. These disciplines include ergonomics, health sciences, human and social sciences, natural sciences, and engineering. Five thematic scholarships are also offered: four to encourage new researchers to investigate the prevention of mechanical risks (cuts, lacerations, needle punctures, slips and falls, trench cave-ins, etc.) and one on road safety, given that transportation accidents rank first among causes of workplace fatalities.

SPECIAL PROGRAM

Given a recurrent problem with filling certain researcher positions, a special committee was formed by the Scientific Advisory Board in 2009 to tackle this issue. The committee found traditional recruitment methods for these positions to be inadequate. To remedy the problem, the Board of Directors introduced a special program allowing its research scientists to complete their doctoral studies or postdoctoral training. Six such specialists will now be able to help maintain staff in the Chemical and Biological Hazard Prevention and Mechanical and Physical Risk Prevention fields, where certain positions are hard to fill.

Industrial hygienists' expertise is extremely useful when assessing and controlling constraints related to the work environment. Given the anticipated shrinking of this expertise pool, the IRSST decided to consolidate its resources by offering two of its young chemists the opportunity to enhance their knowledge by pursuing studies leading to certification as a Certified Industrial Hygienist (CIH). We are proud to say that they both rose to the challenge brilliantly.

CAREER SCHOLARSHIPS

Acknowledging the importance of supporting the next generation of scientists, in the summer of 2014, the Fonds de recherche du Québec (FRQ)—the umbrella agency for the three research funds (Fonds québécois de recherche sur la nature et les technologies, Fonds québécois de la recherche sur la société et la culture, and Fonds de la recherche en santé du Québec)—and the IRSST signed a memorandum of understanding on support for OHS researchers. This collaborative initiative should lead to the awarding of three career scholarships to promising young OHS researchers. The scholarships will be awarded for a four-year period and range from $30,000 to $88,000 in total per year. These career scholarships will be supplemented by an annual establishment grant of $25,000 for three years.

OCCUPATIONAL MEDICINE

The IRSST supports the occupational medicine subspecialty program offered by the Department of Environmental and Occupational Health at Université de Montréal. It does so through its Laboratory Division, which hosts two doctors for an observation and self-learning traineeship in industrial toxicology.

Damien Burlet-Vienney

Bertrand Galy

Sabrina Gravel

Sabrina Jocelyn

Joannie Martin

Philippe Sarazin

AWARDS FOR EXCELLENCE

Through its association with well-established organizations in the research community, the IRSST acquires ideas of other possible ways to promote OHS researcher training and retention. These include the ACFAS-IRSST awards handed out each year to two deserving students: one for an outstanding doctoral thesis and the other for an outstanding Master's thesis. These awards are remitted on the *Journée de la relève en recherche* (a day dedicated to the next generation of researchers) organized by the Association francophone pour le savoir (ACFAS) and the Fonds de recherche du Québec.

By encouraging its own researchers to hold positions as associate professors at one or more universities, the Institute also promotes the emergence of a new generation of researchers. Its scientists may supervise students at the Master's or doctoral level and act as thesis advisors. This allows them to introduce students to OHS and induce them to consider careers in this field. In addition, each year, the Institute hosts a few dozen students, trainees, and professors on sabbatical, with a view to forming a new talent pool.

AN EXTERNAL NETWORK

There are certain advantages to having the dual vocation of funding organization and research centre. The IRSST is able to create and expand a sizeable network of external researchers comprised of university professors and scientists at private research centres. Every year, newcomers join the network and opt to carry out research projects and activities on occupational injury prevention and worker rehabilitation. They increase the critical mass required to meet the knowledge needs voiced by our partners. The network makes it possible to further boost OHS research and to attract, among others, researchers specializing in disciplines that are poorly represented or nonexistent among the Institute's personnel. In 2014, our external talent pool included more than 200 researchers.

RESEARCH CHAIRS

In addition to increasing the IRSST's research capacities, the funding of research chairs is another approach used by the Institute to help train new researchers. One example is the OHS Research Chair in Gender, Work, and Health of the Department of Kinesiology and Physical Education at McGill University. The Institute will invest $800,000 in this chair between now and 2017.

ONE THING IS CLEAR: THE URGENCY OF THE WORKFORCE MANAGEMENT ISSUE HAS MADE IT AN INSTITUTIONAL PRIORITY.

The changing of the guard is being felt to some degree at all levels of the IRSST, not solely in relation to the scientific workforce. It is also affecting the Finance and Administration Division, which saw a major turnover in management staff in the Information Technologies and Financial and Physical Resources departments. The same applied to the staff of the Research and Expertise Division and the Laboratory Division, where young professionals benefit from hands-on training. Nor have these changes spared the Scientific Advisory Board. Half of the 14 members who sat on this board in 2014 were new since 2013, including five of the six members from the scientific and technical community.

One thing is clear: the urgency of the workforce management issue has made it an institutional priority. And it will remain so to mitigate the effects of the anticipated retirements of many staff members over the years ahead. In this way and this way alone will the Institute be able to contemplate the future of OHS research with peace of mind and ensure its sustainability.

PRODUCTION BY **RESEARCH FIELD**

This section covers the scientific production of the four research fields and the special projects for which work was done in 2014. The results of one project for each field are given as an example to illustrate its contribution to the advancement of OHS knowledge. This is followed by a list of the scientific projects and activities carried out or funded by the IRSST and for which work began during the year, and a list of new publications, knowledge transfer projects, scientific articles, and other publications.

RESEARCH PROJECTS

In 2014, of 185 active projects, the initial work began on 35. Apart from special activities, the projects were essentially divided among the IRSST's research fields:

- Chemical and Biological Hazard Prevention
- Mechanical and Physical Risk Prevention
- Sustainable Prevention and Work Environment
- Occupational Rehabilitation.

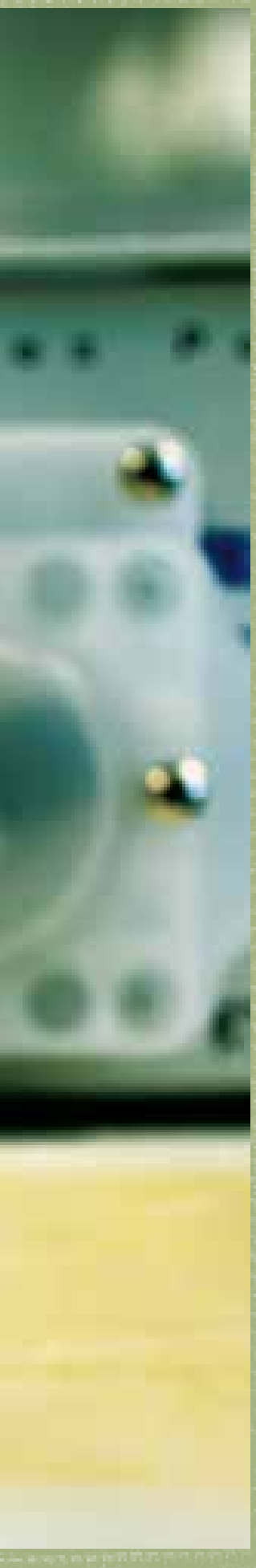
THE IRSST'S PUBLICATIONS

The IRSST added 57 of its own publications to its document holdings in 2014. This contribution of science and expertise to the advancement of knowledge in the field of occupational health and safety took various forms, including research reports, literature reviews, technical fact sheets, and practical guides, not to mention utilities (computer-based tools), Web sites, and videos.

SCIENTIFIC PUBLICATIONS

The results of projects and activities carried out or funded by the IRSST yielded 71 peer-reviewed scientific publications in 2014.

CHEMICAL AND BIOLOGICAL **HAZARD PREVENTION**



THE RESEARCH ORIENTATIONS OF THIS FIELD ARE:

1. Development of strategies and methods for evaluating exposure and estimating health risks using toxicological and epidemiological approaches, among others
2. Development and validation of technologies and tools designed to reduce and control exposure
3. Development of methods for sampling and analyzing chemical substances and biological agents.

EXPOSURE TO CHEMICAL SUBSTANCES

GENDER-BASED ANALYSIS

The results of one of the very first gender-based analyses of occupational exposure to chemical substances were published in 2014. Using high-quality epidemiological data from two studies—one on lung cancer and the other on breast cancer—that documented in detail the work history of 1,657 men and 2,073 women in the Montréal region toward the end of the 1990s, the researchers estimated and compared the proportion and levels of men's and women's exposure to 243 toxic substances, taking into account or not the economic activity involved. The analysis of all occupations and activity sectors combined revealed occupational exposure differences between jobs held by men and those held by women. Men's jobs were found to expose a greater proportion of men to exhaust gases, petroleum products, polycyclic aromatic hydrocarbons (PAHs), dusts from construction materials, and dusts from abrasives, while greater proportions of women were exposed to fabric dusts, textile fibres, ammonia, formaldehyde, and aliphatic aldehydes.

THE ANALYSIS OF ALL OCCUPATIONS AND ACTIVITY SECTORS COMBINED REVEALED OCCUPATIONAL EXPOSURE DIFFERENCES BETWEEN JOBS HELD BY MEN AND THOSE HELD BY WOMEN.

The study also highlighted the need to perform gender-stratified analyses of worker data to shed clearer light on the differences in occupational exposure and injuries. Using data on occupation and activity sector alone is not enough to identify the nuances of tasks that are associated with both jobs and worker gender. In addition, the study underscores the importance of describing workers' tasks when the objective is to accurately characterize occupational exposure.

The Chemical and Biological Hazard Prevention field launched 10 new projects in 2014:

2010-0050 — *Bioaerosol exposure in wastewater treatment centres: molecular approach applications and viral risks,* **Caroline Duchaine, Jacques Lavoie.**

2010-0061 — *Use of dendritic cells as biosensors for the biological quality of the air,* **David Marsolais, Caroline Duchaine.**

2011-0024 — *Fibrogenic and carcinogenic agents in Québec gold and iron mines: exploratory study,* **Chantal Dion, France Labrèche, Ginette Truchon, Félix Gervais, Guy Perrault.**

2012-0044 — *Improving the accuracy of work hygiene models used to estimate occupational exposure to solvent vapors,* **Maximilien Debia, Stéphane Hallé, Ali Bahloul, Daniel Drolet.**

2012-0048 — *Detection of microorganisms in deposits or in aerosols by RAMAN UV/fluorescence (Exploratory study),* **Yves Cloutier, Jean-François Cormier, Geneviève Marchand, Jacques Lavoie, Jean-François Gravel.**

2013-0062 — *Elimination of toxic gases and vapours by oxidation – laboratory development of a methodology for evaluating air purification technique,* **Fariborz Haghighat, Ali Bahloul, Claude Ostiguy.**

2013-0091 — *Review and critical analysis of the scientific literature on the evaluation of occupational exposure to nanomaterials in the workplace,* **Maximilien Debia, Claude Ostiguy.**

2013-0096 — *Benchmarking of IMIS (OSHA, USA) and LIMS (IRSST, Québec) exposure databanks,* **Jérôme Lavoué, France Labrèche, Philippe Sarazin, Jacques Lesage.**

2014-0030 — *Knowledge transfer activity: Prevention fact sheet for safe use of biological degreasing stations,* **Marie-France d'Amours, Michel Gérin, Denis Bégin, Jacques Lavoie, Linda Savoie.**

2014-0053 — *Knowledge transfer activity: A support tool for choosing respiratory protection against bioaerosols,* **Jacques Lavoie, Ève Neesham-Grenon, Marie-France d'Amours, Linda Savoie, Mohammed Ameziane Meddour, Yves Cloutier, Geneviève Marchand, Maximilien Debia.**

The research work done in the Chemical and Biological Hazard Prevention field gave rise to the publication of 13 reports, 2 technical fact sheets, and 2 intervention tools. These included 6 translations.

LAVOIE K. L., JOSEPH M., FAVREAU H., LABRECQUE M., CARTIER A., LEMIÈRE C., MALO J.-L., GAUTRIN D., DITTO B., BACON S. L., *Psychiatric Disorders among Patients under Investigation for Occupational Asthma: Prevalence and Impact on Employment Status and Health Service Use,* Studies and Research Projects / Report R-837, Montréal, IRSST, 2014, 35 pages.

BLAIS LECOURS P., VEILLETTE M., MARSOLAIS D., CORMIER Y., KIRYCHUK S., DUCHAINE C., *Archaea in Bioaerosols in Dairy Farms, Poultry Houses and Wastewater Treatment Plants and Their Role in Lung Inflammation,* Studies and Research Projects / Report R-845, Montréal, IRSST, 2014, 40 pages.

BAHLOUL A., VILLALPANDO F., CHAVEZ M., REGGIO M., GOYER N., *Modélisation par simulation numérique de la ventilation des silos-tours en tenant compte de la chute,* Études et recherches / Rapport R-818, Montréal, IRSST, 2014, 30 pages.

TRUCHON G., HUARD M., LÉVESQUE M., SAUVÉ J.-F., LARIVIÈRE P., TARDIF R., *Surveillance biologique de l'exposition professionnelle — Quel mode de correction urinaire choisir lors de prélèvements ponctuels ?,* Études et recherches / Rapport R-821, Montréal, IRSST, 2014, 41 pages.

BLAIS LECOURS P., VEILLETTE M., MARSOLAIS D., CORMIER Y., KIRYCHUK S., DUCHAINE C., *Archaea des bioaérosols de fermes laitières, des poulaillers et des usines d'épuration des eaux usées — Leur rôle dans l'inflammation pulmonaire,* Études et recherches / Rapport R-827, Montréal, IRSST, 2014, 42 pages.

BÉGIN D., GÉRIN M., LAVOIE J., *Risques associés aux préparations bactériennes et enzymatiques pour le dégraissage et le nettoyage,* Études et recherches / Rapport R-829, Montréal, IRSST, 2014, 87 pages.

TRUCHON G., ZAYED J., BOURBONNAIS R., LÉVESQUE M., DELAND M., BUSQUE M.-A., DUGUAY P., *Thermal Stress and Chemicals — Knowledge Review and the Highest Risk Occupations in Québec,* Studies and Research Projects / Report R-834, Montréal, IRSST, 2014, 45 pages.

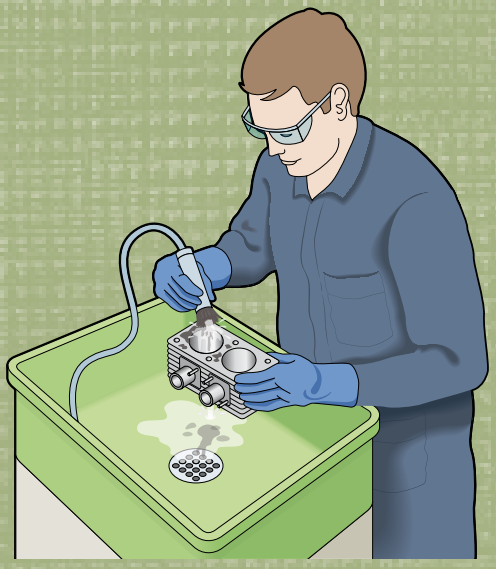
LAVOIE K. L., JOSEPH M., FAVREAU H., LABRECQUE M., CARTIER A., LEMIÈRE C., MALO J.-L., GAUTRIN D., DITTO B., BACON S. L., *Troubles psychiatriques chez les patients soumis à une évaluation relative à l'asthme professionnel — Prévalence et impact sur la situation d'emploi et l'utilisation des services de santé,* Études et recherches / Rapport R-838, Montréal, IRSST, 2014, 39 pages.

OSTIGUY C., DEBIA M., ROBERGE B., DUFRESNE A,. *Nanomatériaux — Guide de bonnes pratiques favorisant la gestion des risques en milieu de travail, 2e édition,* Études et recherches / Rapport R-840, Montréal, IRSST, 2014, 98 pages.

LABRÈCHE F., LACOURT A., LAVOUÉ J., *Expositions professionnelles à des contaminants chimiques et physiques : Analyse différenciée selon le sexe,* Études et recherches / Rapport R-842, Montréal, IRSST, 2014, 67 pages.

BÉGIN D., GÉRIN M., LAVOIE J.,
Safe Use of Biological Degreasing Stations, Studies and Research Projects / Technical Data Sheet RF-855, Montréal, IRSST, 2014, 5 pages.

Published in French and English, these technical fact sheets are designed to prevent occupational injuries caused by the use of biological degreasing stations. These stations are used in motor vehicle garages and mechanical maintenance shops for manually removing grease from metal parts, among other things. Biological degreasing fluids replace traditional solvent-based products, which are much more toxic and flammable. However, certain precautions must be taken if these degreasing fluids are to be used safely. While they contain bacteria that are generally harmless, other bacteria may be introduced inadvertently, for example, by dirt found on the parts themselves. These other bacteria can contaminate the degreaser and pose a moderate risk of infection. Using the evidence-based data taken from a study of the risks related to these bacterial preparations, the fact sheets describe biological degreasing stations, the health effects and risks associated with the bacteria they contain, and the preventive measures to be taken in the workplaces concerned.



BÉGIN D., GÉRIN M., LAVOIE J., *Fiche de prévention — Utilisation sécuritaire des fontaines biologiques de dégraissage*, Études et recherches / Fiche technique RF-829, Montréal, IRSST, 2014, 5 pages.

LEMIÈRE C., BLAIS L., *L'absence d'éosinophilie bronchique est-elle un facteur de mauvais pronostic de l'asthme professionnel ?*, Études et recherches / Rapport R-809, Montréal, IRSST, 2014, 19 pages.

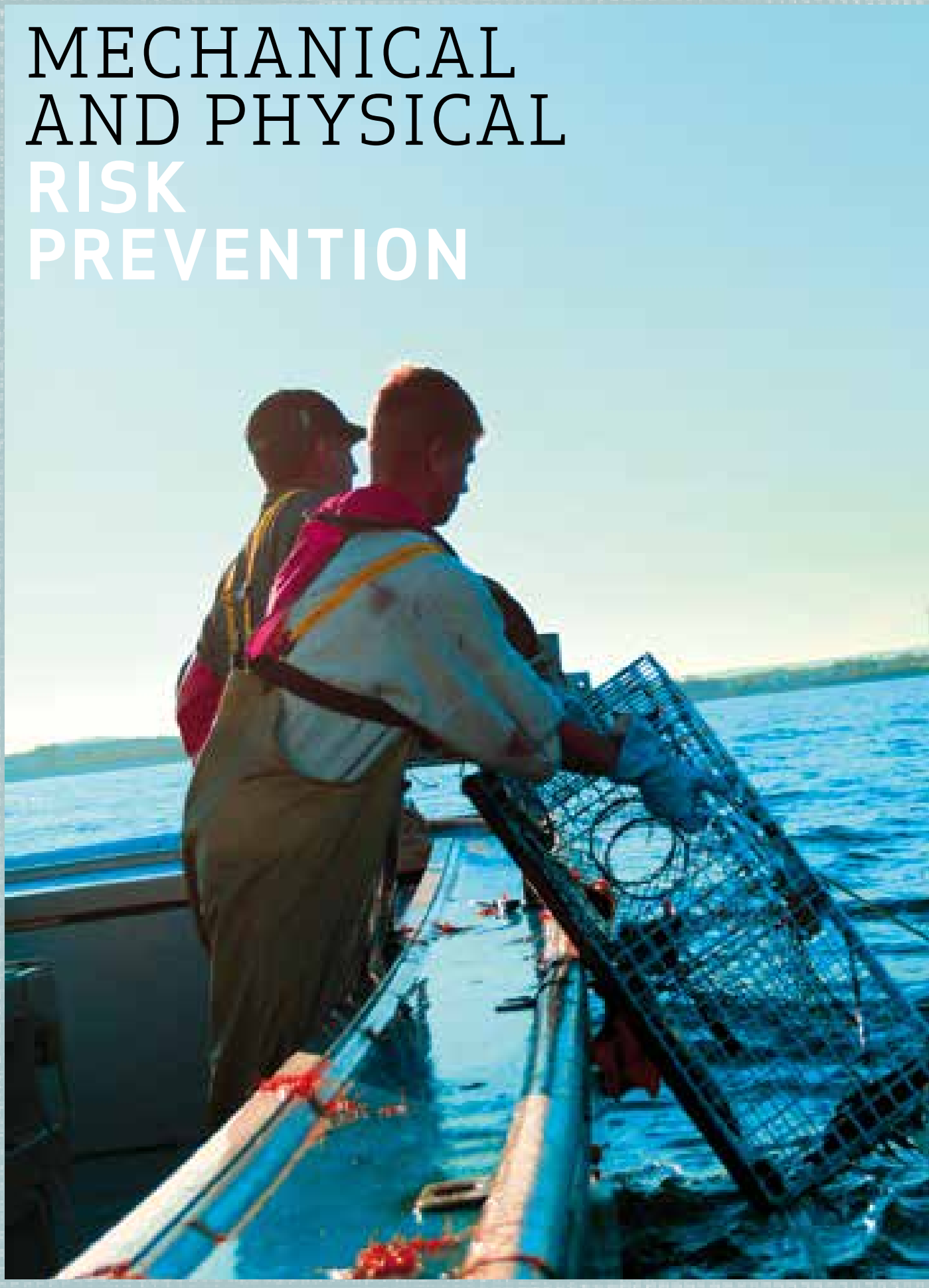
SONGMENE V., KHETTABI R., VIENS M., KOUAM J., HALLÉ S., MORENCY F., MASOUNAVE J., DJEBARA A., *Mesure, contrôle et caractérisation des nanoparticules — Procédure appliquée à l'usinage et au frottement mécanique*, Études et recherches / Rapport R-814, Montréal, IRSST, 2014, 77 pages.

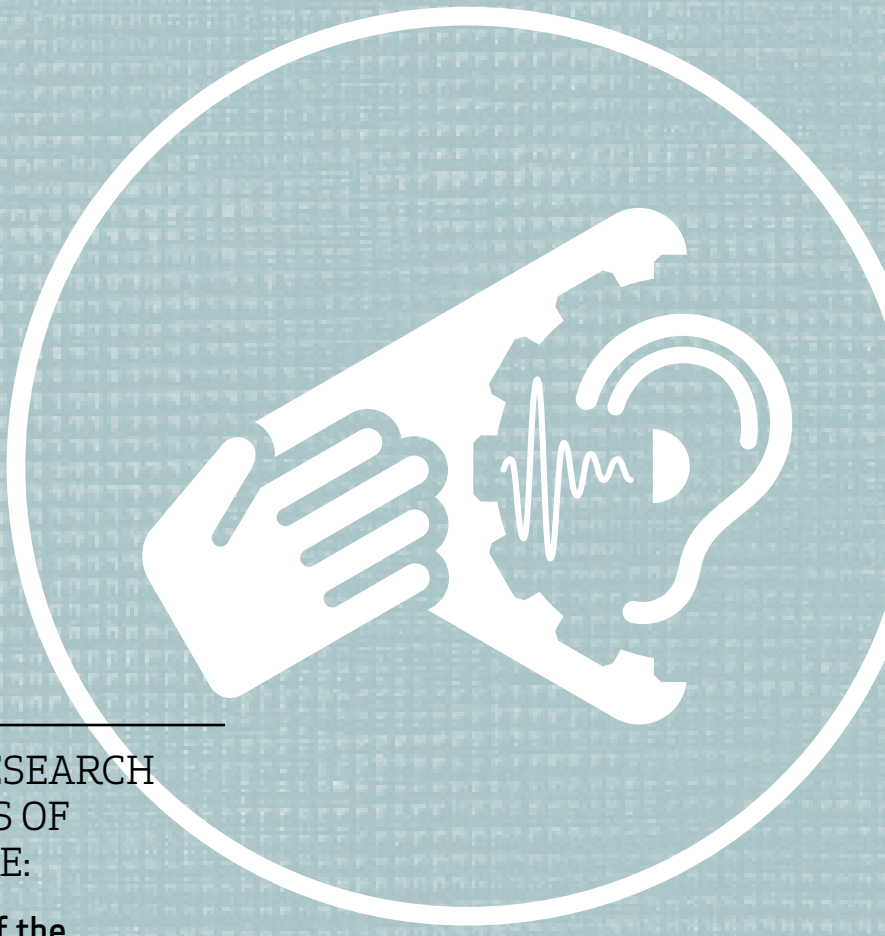
LABRÈCHE F., DUGUAY P., OSTIGUY C., GOYER N., BOUCHER A., ROBERGE B., BARIL M., *Carcinogenic Substances — Exposure Profile of Quebec Workers*, Studies and Research Projects / Report R-830, Montréal, IRSST, 2014, 71 pages.

LABRÈCHE F., ROBERGE B., GRAVEL S., D'AMOURS M.-F., *Are there carcinogens in your workplace? It's time to act! (Action plan — writable)*, DI-796, Montréal, IRSST, 2014, 1 page.

LABRÈCHE F., ROBERGE B., GRAVEL S., D'AMOURS M.-F., *Y a-t-il des cancérogènes dans votre milieu de travail ? Passez à l'action !*, DI-790, Montréal, IRSST, 2014, 1 page.

MECHANICAL AND PHYSICAL **RISK PREVENTION**





THE THREE RESEARCH ORIENTATIONS OF THIS FIELD ARE:

1. Assessment of the mechanical and physical risks generated by machines or the work environment
2. Reduction of mechanical and physical risks
3. Taking the human factor into account in the evaluation and control of mechanical and physical risks.

AN "ALL-HAZARDS" OCCUPATION

ABOARD CRABBERS

It is not because an occupation has existed for millennia that those who practice it are exempt from the inherent risks. Ranking among the most dangerous occupations because it is performed under often-difficult conditions on a moving, slippery surface exposed to the elements, commercial fishing was the focus of two research activities and one knowledge transfer activity.

Researchers tested the performance of the two most popular roll-damping systems used in Québec to reduce the impact of motion caused by ocean swell or waves, which can lead to falls overboard of mid-shore fishers. Some 60 sea trials were conducted aboard two twin crabbers, one equipped with hinged fins and the other with paravanes. They allowed the scientists to investigate, using specialized instruments, three aspects of concern to fishers and regulatory agencies: vessel stability, crew safety and comfort, and energy (fuel) costs. The data collected showed that neither system was superior to the other. However, the hinged-fin roll-damping system offered substantially greater ease of handling. The fishers also reported that the number and severity of incidents-accidents aboard the vessels equipped with paravanes were clearly greater than those on crabbers equipped with hinged fins. The popularity of the hinged-fin system was reflected in very high levels of satisfaction in all respects, specifically, ease of handling, crew comfort and safety, and overall performance at sea.

THE POPULARITY OF THE HINGED-FIN SYSTEM WAS REFLECTED IN VERY HIGH LEVELS OF SATISFACTION IN ALL RESPECTS.

Crabber equipped with paravanes.

ABOARD LOBSTER BOATS

As on crabbers, fishers on lobster boats are all too familiar with danger. Coupled with weather conditions that can intensify the roll of these boats as they are buffeted around by waves and wind is the fact of handling heavy traps on slippery, unstable surfaces and long ropes and gear that can unexpectedly drag fishers overboard. While there is nothing new about lobster fishing and the accidents associated with it, this was the first time in Québec and Canada that scientists studied the risks of falls overboard posed by this occupation, in addition to documenting and identifying the most promising avenues for reducing these risks. To assess the risks and identify incident scenarios, the researchers had questionnaires completed by captains and deckhands, made direct observations, and shot videos aboard seven vessels during 20 outings at sea; they also carried out a literature review. They documented the six most hazardous work situations, analyzed the risk factors, and classified them in four main categories: those related to rope management and work methods, those related to the weather and fishery management regulations, those related to workers' attitudes and experience, and those related to the layout of the boat, wharf, and equipment.

THIS WAS THE FIRST TIME IN QUÉBEC AND CANADA THAT SCIENTISTS STUDIED THE RISKS OF FALLS OVERBOARD

When presenting the study results to the partners involved, the importance of transferring prevention knowledge to fishers quickly emerged as one way to highlight the best practices. However, as the initial research was not aimed specifically at doing this, a complementary knowledge transfer activity was carried out to clearly identify and prioritize these practices before incorporating them into existing training programs. This prevention knowledge concerns, among other things, the set-up of work stations (trap hauler and support tables), collective practices and working methods, and identification of hazardous conditions.

The Mechanical and Physical Risk Prevention field launched 10 new projects in 2014:

2013-0002 — *Knowledge transfer activity: Reverse alarms: how to differentiate them?* **François Ouellet.**

2013-0003 — *Knowledge transfer activity: Guidelines for purchasing work footwear for outdoor winter conditions,* **François Ouellet.**

2013-0019 — *Comparative study of modelling tool performance with respect to two occupational health and safety problems: noise and pulse-type vibrations,* **Noureddine Atalla, Celse-Kafui Amédin, Franck Sgard.**

2013-0034 — *Effects of chronic exposure to high-pressure environments on the lung function of caregivers in hyperbaric chambers,* **Dominique Buteau, Julie Plante, Richard Belley, Marie-Ludivine Chateau-Degat, Éric Petitclerc.**

2013-0047 — *Evaluation of a horizontal lifeline system and anchorages used in installing residential roofs,* **André Lan, Bertrand Galy.**

2013-0082 — *Follow-up, evaluation and review of a lockout implementation approach for municipal mobile equipment,* **Damien Burlet-Vienney, Yuvin Chinniah.**

2013-0092 — *Update of the technical guide to designing horizontal lifelines,* **Bertrand Galy, André Lan.**

2013-0094 — *Ergonomic analysis of the thermal comfort and mobility of motorcycle police officers wearing bullet-proof vests and development of criteria for selecting and designing vests better suited to their work,* **Steve Vezeau, Alain-Steve Comtois.**

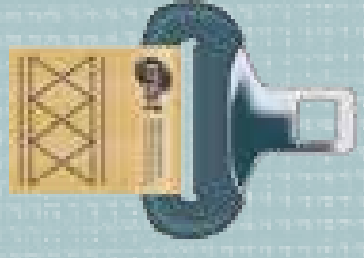
2014-0035 — *Reproduction of industrial sound environments for use in audibility studies on alarms and other sound signals for occupational health and safety: proof of concept,* **Alain Berry, Hugues Nélisse, Philippe-Aubert Gauthier, Franck Sgard.**

2014-0046 — *Collaborative robotics: Feedback from workers, users and integrators in Québec,* **Sabrina Jocelyn, Damien Burlet-Vienney, Laurent Giraud, Adel Sghaier.**

The work done in the Mechanical and Physical Risk Prevention field gave rise to the publication of 10 research reports, 3 technical fact sheets, and 2 intervention tools. These included 4 translations.

BEAUGRAND S., LARUE C., RANCOURT D., *Lift Trucks – How to Choose the Right Seat Belt Assembly,* Studies and Research Projects / Technical Fact Sheet RF-839, Montréal, IRSST, 2014, 8 pages.

BEAUGRAND S., LARUE C., RANCOURT D., *Lift Trucks – How to Choose the Right Seat Belt Assembly, Interactive Worksheet,* Studies and Research Projects / Intervention Tool DI-839, Montréal, IRSST, 2014, 5 pages.



This practical guide and complementary worksheet were developed with the assistance of a working group representing various industry sectors. They are designed to help occupational health and safety professionals and practitioners choose appropriate seat belt assemblies to protect lift truck operators. The technical fact sheet presents succinct, useful information in two sections: one promoting action on the work environment to limit activities likely to cause the inconveniences associated with wearing seat belts, and the other describing the options available for certain components of the belt assembly, such as webbing retractors, buckles, and latch plates. Together, these documents allow an informed choice to be made, particularly if operators participate in the process by voicing their needs and the solutions they think are best adapted to their situations

AMÉDIN C. K., ATALLA N., SGARD F., *Méthodes de simulation temporelles pour résoudre des problématiques de bruit et vibrations – Revue de la littérature,* Études et recherches / Rapport R-806, Montréal, IRSST, 2014, 44 pages.

COULOMBE F., FOURNIER M.-H., LANGEVIN A., *Évaluation de systèmes d'amortissement du roulis sur les bateaux de pêche semi-hauturière du Québec,* Études et recherches / Rapport R-811, Montréal, IRSST, 2014, 53 pages.

MARCHAND D., MARCOTTE P., LARIVIÈRE C., KELLY C., MANDEVILLE-GAUTHIER V., *Outils vibrants – Paramètres biomécaniques et sensorimoteurs affectant la réponse biodynamique du système main-bras,* Études et recherches / Rapport R-815, Montréal, IRSST, 2014, 103 pages.

CHAUMEL J.-L., GIRAUD L., ILINCA A., *Secteur éolien – Risques en santé et en sécurité au travail et stratégies de prévention,* Études et recherches / Rapport R-820, Montréal, IRSST, 2014, 52 pages.

CHINNIAH Y., JOCELYN S., AUCOURT B., BOURBONNIÈRE R., *Presses à injection de plastique ayant des équipements périphériques – Sécurité lors des interventions de maintenance ou de production,* Études et recherches / Rapport R-822, Montréal, IRSST, 2014, 123 pages.

MONTREUIL S., COULOMBE F., RICHARD J.-G., TREMBLAY M., *Chute par-dessus bord de l'équipage des homardiers du Québec – Analyse des risques et pistes de prévention,* Études et recherches / Rapport R-831, Montréal, IRSST, 2014, 101 pages.

BEAUGRAND S., LARUE C., RANCOURT D., *Lift Trucks – How to Choose the Right Seat Belt Assembly,* Studies and Research Projects / Technical Data Sheet RF-839, Montréal, IRSST, 2014, 8 pages.

BEAUGRAND S., LARUE C., RANCOURT D., *Lift Trucks – How to Choose the Right Seat Belt Assembly (Interactive worksheet),* Studies and Research Projects / Interactive worksheet DI-839, Montréal, IRSST, 2014, 5 pages.

GAUVIN C., PEARSALL D., DAMAVANDI M., MICHAUD-PAQUETTE Y., FARBOS B., IMBEAU D., *Facteurs de risque associés aux glissades chez les policiers et les brigadiers scolaires – Étude exploratoire,* Études et recherches / Rapport R-856, Montréal, IRSST, 2014, 87 pages.

RANCOURT D., BEAUGRAND S., LARUE C., MASSON G., *Ceinture de sécurité pour chariots élévateurs à contrepoids – Étude préliminaire de critères normatifs et d'utilisabilité (version révisée),* Études et recherches / Rapport R-765, Montréal, IRSST, 2014, 72 pages.

RANCOURT D., BEAUGRAND S., LARUE C., MASSON G., *Seat Belt Assemblies for Counterbalanced Lift Trucks – Preliminary Study of Normative and Usability Criteria,* Studies and Research Projects / Report R-844, Montréal, IRSST, 2014, 69 pages.

VAILLANCOURT V., NÉLISSE H., LAROCHE C., GIGUÈRE C., BOUTIN J., LAFERRIÈRE P., *Safety of Workers Behind Heavy Vehicles: Assessment of Three Types of Reverse Alarm,* Studies and Research Projects / Report R-833, Montréal, IRSST, 2014, 85 pages.

OUELLET F., THIBEAULT M.,
Choisir une soufflette efficace et sécuritaire, [Choosing a safe, efficient blow gun], RF-612, Montréal, IRSST, 5 pages.

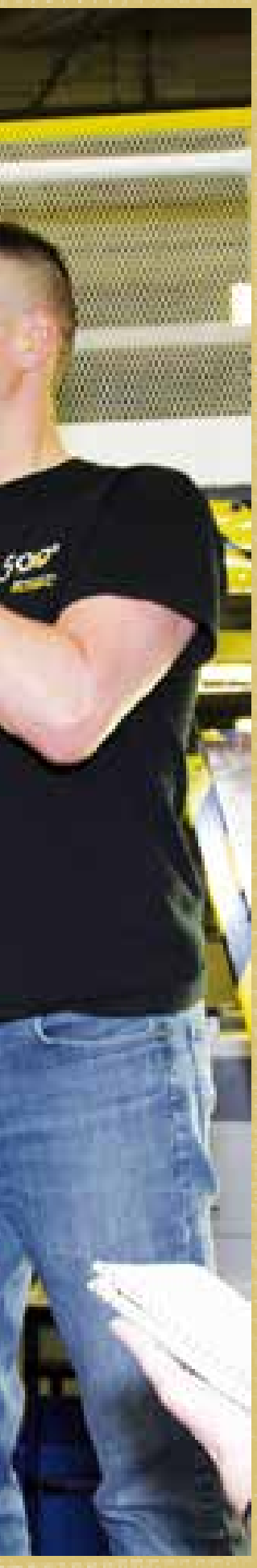
Blow guns, which are used to blow compressed air, are useful for light cleaning, drying, and removing dust from parts and work areas. Developed as a collaborative effort, this technical guide covers the use and features of different blow nozzles attached to compressed air guns. It describes the related hazards and includes safety instructions and a table designed to facilitate the process of choosing the most appropriate nozzle for the job.

THEMATIC PROGRAMS

The Mechanical and Physical Risk Prevention field proposed two new thematic programs. The first concerns slips and falls on outdoor surfaces. It focusses on the following themes: (1) the study of biomechanical response and motor control on icy and snowy surfaces, (2) the evaluation and development of non-slip soles and footwear, and (3) training. The program derives from a preliminary study conducted on the causes of and risk factors involved in slips and falls among police officers and school crossing guards.

The focus of the second program is audible alarms in the workplace. It proposes work on broadband reverse alarms and on models of varying noise intensity, or a combination of the two, to determine their effectiveness in the workplace in terms of sound propagation, localization, noise intensity, and perception of sound intensity.

SUSTAINABLE PREVENTION AND WORK ENVIRONMENT



THE RESEARCH ORIENTATIONS OF THIS FIELD ARE:

1. Analysis of the impacts of organizational, demographic, and technological changes within enterprises on occupational health and safety
2. Development and application of measurement methods and evaluation tools (measurement of exposure and risk and protection factors, activity analysis, surveys, and data collection tools)
3. Interventions pertinent to, and management of, OHS problems (e.g. OHS management in small enterprises, OHS management tools).

WORK ENVIRONMENT

JOB ROTATION

Well known for its capacity to conduct field research in collaboration with employers and their workers, the IRSST received a request from the management of a major aircraft company and its union asking it to identify the conditions required to implement a form of work organization that favours a job rotation system. The goal was to prevent musculoskeletal disorders (MSDs) and improve versatility among aircraft assemblers. With wide leeway in terms of assigning personnel, the company was seeking better ways to cope with work absences, the occasional labour shortage, and production fluctuations.

One division comprised of four workstations for assembling the cockpits of two types of aircraft, where around 20 workers were supervised by three team leaders, became the researchers' laboratory. Assembling a cockpit is a four-day job. To do so, the workers are subject to physical constraints and have to apply a high level of expertise to meet, among other things, the extremely high quality requirements specific to the aerospace industry. Rotation among long-cycle jobs is a subject of research on which only piecemeal advances in knowledge have been made. The project therefore required the scientists involved to come up with innovative research methods involving observation, one-on-one interviews, and group validation meetings. The result was enhanced understanding of aircraft production, the role of the various divisions and their interactions, the assemblers' state of health, the risk factors they are exposed to, their learning difficulties, and their perception of job rotation. Using original monitoring methods, it was possible to study the situation prevailing after the implementation of two job-rotation trials four months apart.

THE GOAL WAS TO PREVENT MUSCULOSKELETAL DISORDERS (MSDS) AND IMPROVE VERSATILITY AMONG AIRCRAFT ASSEMBLERS.

Assisted by the research team, an internal steering committee was then formed to manage the continuation of the study through a structured project-management process. Everything was carried out in a positive employer-union atmosphere, which in turn had a positive impact on the participation of all stakeholders. The constructive discussions held by the steering committee members pointed to solutions to the job rotation and employment injury prevention issue.

Marie St-Vincent and Maud Gonella observe workers at an aircraft plant.

The Sustainable Prevention and Work Environment field launched 6 new projects in 2014:

2012-0025 — *Comparative analysis of work context and statistical overview of occupational health and safety problems, by company size,* **Danièle Champoux, Pascale Prud'homme.**

2012-0040 — *Development and implementation of a measurement system and a measurement protocol for quantifying the physical exposure of material handlers,* **André Plamondon, Denys Denis, Christian Larue, Alain Delisle, Philippe Corbeil, Alexandre Rouleau.**

2012-0050 — *OHS conditions and retention of senior workers in a Québec educational environment,* **Alessia Negrini, Marc Corbière.**

2013-0046 — *Fatigue-related risk management system for police officers in patrol cars,* **Diane B. Boivin, Guy Dumont, Norbert Schmitz.**

2014-0021 — *Criteria for safe installation of hauler and box support stations on lobster boats: joint development with fishers, test bench validation and implementation strategies,* **Francis Coulombe, Sylvie Montreuil, Jean-Guy Richard.**

2014-0029 — *Understanding the impact of regulating time constraints on the uptake of the general Principles for Moving Patients Safely (PDSB) among new patient attendants,* **François Aubry, Élise Ledoux, Yves Couturier, Lise Desmarais.**

The work done in the Sustainable Prevention and Work Environment field gave rise to the publication of 6 reports, 2 technical fact sheets, 1 electronic book, and 1 Web site project. These included 5 translations.

ST-VINCENT M., VÉZINA N., BELLEMARE M., DENIS D., LEDOUX É., IMBEAU D., *Ergonomic Intervention (eBook),* DS-009, Montréal, IRSST, 2014.

The IRSST edited and published its first eBook in English. This translation of *L'Intervention en ergonomie* was designed in ePUB format. It takes the form of a file that can be downloaded, stored, and read on-screen on an e-reader, PC, or tablet.

LABERGE L., LEDOUX É., AUCLAIR J., GAUDREAULT M., *Jeunes du secondaire et du collégial qui cumulent études et travail – Une enquête sur les conditions d'exercice du travail et la SST,* Études et recherches / Rapport R-795, Montréal, IRSST, 2014, 57 pages.

DESMOULINS L., MICHAUD B., ALLARD P., PLAMONDON A., BEGON M., *Cinématique et modélisation biomécanique de l'épaule lors de tâches de manutention,* Études et recherches / Rapport R-828, Montréal, IRSST, 2014, 84 pages.

DENIS D., ST-VINCENT M., GONELLA M., *Conditions préalables à l'implantation de la rotation chez une population d'assembleurs-monteurs du secteur de l'aéronautique — L'impact des exigences de qualité sur le développement de la polyvalence et sur l'apprentissage,* Études et recherches / Rapport R-853, Montréal, IRSST, 2014, 95 pages.

CORBEIL P., PLAMONDON A., TEASDALE N., HANDRIGAN G., TEN HAVE J., MANZEROLLE N., *Biomechanical and Ergonomic Impacts of Handling in Obese Workers,* Studies and Research Projects / Report R-825, Montréal, IRSST, 2014, 45 pages.

FILLION L., TRUCHON M., L'HEUREUX M., GÉLINAS C., BELLEMARE M., LANGLOIS L., DESBIENS J.-F., DALLAIRE C., DUPUIS R., ROCH G., ROBITAILLE M. A., *Impact of Work Environment on Nurses' Job Satisfaction and Well-Being: Improving End-of-Life Care and Services,* Studies and Research Projects / Report R-846, Montréal, IRSST, 2014, 71 pages.

PLAMONDON A., DENIS D., LARIVIÈRE C., DELISLE A., GAGNON D., ST-VINCENT M., NASTASIA I., *Biomechanics and Ergonomics in Women Material Handlers,* Studies and Research Projects / Report R-808, Montréal, IRSST, 2014, 93 pages.

LORTIE M., ST-VINCENT M., *Planning Tool for Safe Manual Handling,* Studies and Research Projects / Report RF-816, Montréal, IRSST, 2014, 58 pages.

CHATIGNY C., TONDOUX A., *La santé et la sécurité du travail dans les centres de formation professionnelle – La prévention, un projet collectif,* Études et recherches / Fiche technique RF-802, Montréal, IRSST, 2014, 32 pages.

An earlier IRSST study concluded that, despite major effort and investments, vocational training centres (VTCs) remain occupational learning environments that pose OHS risks for instructors, but also for their students, who are aspiring future workers. To remove these obstacles to prevention, a document entitled *La santé et la sécurité du travail dans les centres de formation professionnelle – La prévention, un projet collectif* was drafted for the purpose of supporting OHS efforts in these centres. It may also be useful in college-level technical programs. The core of the document consists of four sheets pertaining to four aspects of prevention that must be taken into account to achieve sustainable OHS: (1) OHS management in VTC centres, (2) teaching and learning about OHS, (3) OHS of instructors, and (4) OHS of students.

PLAMONDON A., DENIS D., SUTTON L., SAVOIE L.
Mise à jour du site Web Manutention en milieu de travail, Knowledge transfer activity, 2014.

Launched in 2008 and updated in 2010, the material handling Web site has a new look. It underwent a major overhaul that consisted of updating and enhancing its content, rethinking its structure to make it more user-friendly, and refreshing its visuals and graphic design. The web site is intended as much for experienced ergonomists and preventionists as for employers and novice or experienced material handlers, and offers accurate, evidence-based information incorporating the latest scientific knowledge to support them in the prevention of musculoskeletal disorders.

COLLOQUIUM OF THE RÉSEAU D'ÉCHANGES SUR LA MANUTENTION

The Réseau d'échanges sur la manutention (REM) held a colloquium around the theme *Les solutions, on les partage!* to promote more effective prevention of the risks associated with manual material handling.

Approximately 150 people, including representatives of 67 companies, took part in this knowledge transfer activity.

THE REM HELD A COLLOQUIUM TO PROMOTE MORE EFFECTIVE PREVENTION OF THE RISKS ASSOCIATED WITH MANUAL MATERIAL HANDLING.

Several testimonials about actual cases and lectures fuelled the workshop discussions. This REM colloquium provided an opportunity for pooling traditional and experiential knowledge about prevention, while enhancing preventionists' toolkits.

LA RECHERCHE EN DIRECT ACTIVITY

Organized by the Comité CSST-IRSST de la recherche en réadaptation au travail (CRERAT), the *Recherche en direct* activity was designed to promote the use of study-generated knowledge by rehabilitation counsellors and the CSST's various OHS professionals and practitioners.

It consisted of presenting research results and facilitating exchanges with scientists to enable participants to determine how this knowledge and expertise could be applied in CSST training, analysis, policies, and orientations.

In 2014, the results of the study aimed at supporting the return to work and job retention of workers with mental health problems were presented to the CSST.

Yvon Tardif, prevention counsellor at the Société des alcools du Québec.

OCCUPATIONAL **REHABILITATION**

THE RESEARCH ORIENTATIONS OF THIS FIELD ARE:

1. Development of tools for assessing the health of workers who have sustained work-related injuries and are at risk of disability
2. Study of the personal, clinical, organizational, and administrative determinants of a return to work
3. Development and implementation of rehabilitation and return-to-work interventions
4. Development and implementation of strategies designed for rehabilitation and return-to-work professionals.

KNEE OSTEOARTHRITIS AND REHABILITATION

In these days of an aging labour force and longer working lives, knee osteoarthritis (knee OA) could undermine the health of two-thirds of working adults ages 55 to 64 from now to 2026. This health problem often causes functional limitations and chronic disabilities, not to mention that it complicates the return to work. The IRSST, in collaboration with the Réseau provincial de recherche en adaptation-réadaptation, therefore funded and published a review of the literature on this disease. The literature is so prolific that professionals sometimes have difficulty wading through the maze. The study focussed mainly on the risk factors associated with the onset of knee OA, the quality and relevance of the evaluation instruments used in rehabilitation, and the intervention options proposed by clinicians.

What emerged from this literature review, which is intended to support clinicians and health professionals, is that the most significant risk factors for which moderate to strong evidence exists are advancing age, being female, obesity, high body mass index (BMI), performing work in kneeling or squatting positions, handling heavy loads, high-intensity physical activities performed over long periods of time, and high bone mineral density. While the majority of evaluation instruments are valid and reliable, the researchers identified a need for more effective instruments to be developed or validated. Lastly, the study concluded that there is no miracle treatment or therapy for people with knee OA, but recommended regular physical exercise. Hyaluronic acid injections are effective but their action is neither immediate nor lasting. Non-steroidal anti-inflammatories (NSAIDs) have significant benefits, but are only a short-term solution with side effects.

REGARDING EVALUATION INSTRUMENTS, WHILE THE MAJORITY ARE VALID AND RELIABLE, THE RESEARCHERS IDENTIFIED A NEED FOR MORE EFFECTIVE INSTRUMENTS TO BE DEVELOPED OR VALIDATED.

The Occupational Rehabilitation field launched 2 new projects:

2012-0055 — *Immediate psychological and biomechanical effects of two categories of lumbar belts in healthcare workers and workers with back pain,* **Christian Larivière, Alessia Negrini, Michael J.L. Sullivan, Richard Preuss.**

2013-0039 — *Evaluation of the different incident-management and employee-support protocols after a serious incident,* **Brian Mishara, Cécile Bardon, Angelo Soares.**

The work done in the Occupational Rehabilitation field gave rise to the publication of 10 research reports, 1 literature review, and 1 technical guide. These included 6 translations.

CORBIÈRE M., ST-ARNAUD L., DURAND M.-J., COUTU M.-F., LECOMTE T., NEGRINI A., RENARD M., *Les facteurs influençant le retour au travail après une dépression — Le point de vue et le rôle des acteurs syndicaux,* Études et recherches / Rapport R-805, Montréal, IRSST, 2014, 47 pages.

CORBIÈRE M., ST-ARNAUD L., DURAND M.-J., COUTU M.-F., LECOMTE T., NEGRINI A., RENARD M., *Factors Influencing the Return to Work after Depression — The Viewpoint and Role of Unions,* Studies and Research Projects / Report R-847, Montréal, IRSST, 2014, 47 pages.

ST-ARNAUD L., PELLETIER M., VÉZINA M., BRIAND C., PAILLÉ P., DEMERS É., *Santé mentale au travail — Projet-pilote pour passer d'une approche individuelle de réadaptation à une approche organisationnelle de prévention,* Études et recherches / Rapport R-807, Montréal, IRSST, 2014, 33 pages.

CÔTÉ D., *The Notion of Ethnocultural Belonging in Rehabilitation Research and Intervention,* Knowledge Summaries / Report B-081, Montréal, IRSST, 2014, 55 pages.

RIVARD M., DENIS J.-L., CONTANDRIOPOULOS A.-P., ROSSIGNOL M., BILODEAU H., STE-MARIE G., LEDERER V., *Evaluation of the Implementation and Impact of the PRÉVICAP Program,* Studies and Research Projects / Report R-810, Montréal, IRSST, 2014, 108 pages.

HAGEMEISTER N., LAGACÉ P.-Y., HERETER GREGORI J., MARCK L., ROULEAU D., BUREAU N., TÉTREAULT P., ROY A., AL-SHAKFA F., *Développement d'un indice radiologique représentatif de la fonction de l'épaule chez des travailleurs souffrant de rupture de la coiffe des rotateurs,* Études et recherches / Rapport R-812, Montréal, IRSST, 2014, 42 pages.

BILODEAU H., MARCHAND A., BERTHELETTE D., GUAY S., TREMBLAY N., *Analyse d'un protocole d'intervention post-traumatique et de mesures de gestion associées au Centre jeunesse de Montréal-Institut universitaire,* Études et recherches / Rapport R-819, Montréal, IRSST, 2014, 102 pages.

ST-ARNAUD L., BRIAND C., CORBIÈRE M., DURAND M.-J., BOURBONNAIS R., SAINT-JEAN M., PELLETIER M., DELISLE S., KEDL E., *Supporting a Return to Work after an Absence for a Mental Health Problem: Design, Implementation, and Evaluation of an Integrated Practices Program,* Studies and Research Projects / Report R-823, Montréal, IRSST, 2014, 103 pages.

GAUDREAULT N., DURAND M.-J., MOFFET H., HÉBERT L., HAGEMEISTER N., FELDMAN D., BERNIER M., GENEST K., LAPRISE S., MAYNARD-PAQUETTTE A.-C., *Bilan des connaissances sur les facteurs de risque de l'arthrose du genou et sur les outils d'évaluation et les interventions en matière de soins et services,* Études et recherches / Rapport R-832, Montréal, IRSST, 2014, 126 pages.

LOISEL P., CORBIÈRE M., DURAND M.-J., COUTU M.-F., DÉSORCY B., HONG Q. N., GENEST K., *Comparative Evolution of Pain and Work Status Following a Rehabilitation Program for Workers with Musculoskeletal Disorders,* Studies and Research Projects / Report R-835, Montréal, IRSST, 2014, 29 pages.

NASTASIA I., COUTU M.-F., CIBOTARU A., *Prévention de l'incapacité prolongée chez les travailleurs indemnisés pour troubles musculosquelettiques — Une revue systématique de la littérature, Mise à jour 2008-2013,* Études et recherches / Rapport R-841, Montréal, IRSST, 2014, 77 pages.

ST-ARNAUD L., PELLETIER M., *Guide to an Integrated Practices Program for Supporting the Return to Work and Promoting Job Retention — Facilitating an Employee's Return to Work following an Absence for a Mental Health Problem,* Studies and Research Projects / Technical Guide RG-813, Montréal, IRSST, 2014, 38 pages.

A Thematic Program

The Occupational Rehabilitation field presented the first component of a thematic program focussed on protecting and supporting workers in vulnerable situations. It involved studies on immigrant workers and workers from ethnocultural minorities in relation to OHS.

SPECIAL **PROJECTS**

Every year, a number of special projects are added to the IRSST's research portfolio. They include projects as well as scientific or knowledge transfer activities concerning indicators, cross-cutting issues, or specific themes. They also include analytical methods developed by our laboratories.

STATISTIQUES SUR MESURE WEB SITE

With leading-edge expertise in the production of occupational injury indicators, the Statistical Surveillance Group, assisted by the Communications and Knowledge Transfer Division, launched a Web site showcasing the IRSST's studies. Intended for our partners in both the workplace and scientific communities, this Web site features thematic projects supported by evidence-based data that are presented in various formats such as videos, downloadable files, graphs, and illustrations.

The first theme concerns occupational injuries. It highlights the importance of taking various aspects into account to answer the question, "At work, do men injure themselves more often than women?" To gain clarity in this regard, the *Statistiques sur mesure* (customized statistics) Web site casts a new light on certain situations while making data produced by the Institute's scientists more widely available and presenting them in a form more suitable to the needs of OHS professionals in the workplace (joint sector-based associations; employer, union and professional associations) and easier to interpret. The Methodology section also explains how the IRSST's statistical indicators are produced and the purpose they serve.

Preparatory work is currently under way on other themes related to occupational injuries analyzed by age and the cost of occupational injuries and work-related road accidents. It will enhance the Web site over time.

THE METHODOLOGY SECTION ALSO EXPLAINS HOW THE IRSST'S STATISTICAL INDICATORS ARE PRODUCED AND THE PURPOSE THEY SERVE.

Videos available on the Statistiques sur mesure *Web site answers the question, "At work, do men injure themselves more often than women?"*

In 2014, 4 new special projects were developed:

2013-0025 — *Indicators of compensated occupational injuries: analysis by industry and occupational category, Québec, 2010-2012,* **Patrice Duguay, Alexandre Boucher, Pascale Prud'homme, Marc-Antoine Busque, Martin Lebeau.**

2014-0014 — *Analysis of the risk of sustaining an injury involving a permanent physical or mental impairment in Québec,* **Marc-Antoine Busque, Patrice Duguay.**

2014-0027 — *Knowledge transfer activity:* Les statistiques sur mesure, **Charles Gagné, Pascale Prud'homme, Patrice Duguay, Linda Savoie.**

2014-0041 — *Feasibility study of evaluating the knowledge transfer strategy used by the IRSST in its research program aimed at improving the occupational health and safety of 911 emergency call centre operators,* **Christian Dagenais, Charles Gagné, Georges Toulouse.**

This activity was the result of a request from the Communications and Knowledge Transfer Division, which wanted to evaluate the impacts of its knowledge transfer (KT) efforts in the research program aimed at improving the OHS of 911 emergency call centre operators. The program involved a wide range of initiatives: identifying the key stakeholders in this sector, forming a sector-based follow-up committee, organizing events to promote exchanges on the issue, preparing results dissemination documents, and producing a DVD. Despite the inventory taken of all the KT efforts made by the IRSST and its partners, it remains difficult to determine and evaluate the spinoffs in the workplaces concerned. This new activity will therefore answer questions about the conditions required to carry out an evaluation before substantial resources are committed to the task of measuring the impacts of the KT strategy. Its aim is to conduct a feasibility study of such an evaluation and to achieve four objectives: (1) produce a literature review, (2) come up with a diagnosis of the possibility of evaluating the knowledge transfer strategy and, if applicable, (3) identify the information available and needed for this evaluation, and (4) define what form the evaluation would take.

The special projects gave rise to the publication of 6 research reports and 3 awareness-raising documents. These included 3 translations:

BAKHIYI B., ZAYED J., *Les défis des emplois verts de l'industrie du photovoltaïque au Québec,* Études et recherches / Rapport R-817, Montréal, IRSST, 2014, 74 pages.

DESSUREAULT P. C., OUPIN P., BOURASSA M., *Pertinence et conditions d'utilisation des indices thermiques dans le contexte québécois,* Études et recherches / Rapport R-824, Montréal, IRSST, 2014, 56 pages.

LABRÈCHE F., DUGUAY P., BOUCHER A., ARCAND R., *Estimating the Number of Cases of Occupational Cancer in Quebec,* Studies and Research Projects / Report R-836, Montréal, IRSST, 2014, 47 pages.

PIGNATELLI S., BELLAVANCE F., DUGUAY P., *Work-Related Road Collisions in Québec, from 2000 to 2008 — Characteristics and Classification,* Studies and Research Projects / Report R-826, Montréal, IRSST, 2014, 69 pages.

LEBEAU M., DUGUAY P., BOUCHER A., *Les coûts des lésions professionnelles au Québec, 2005-2007 (version révisée),* Études et recherches / Rapport R-769, Montréal, IRSST, 2014, 48 pages.

LEBEAU M., DUGUAY P., BOUCHER A., *The Costs of Occupational Injuries in Québec, 2005-2007,* Studies and Research Projects / Report R-843, Montréal, IRSST, 2014, 48 pages.

DUGUAY P., PRUD'HOMME P., BOUCHER A., *Statistiques sur mesure — Indicateurs de lésions professionnelles selon le genre,* DS-005, Montréal, IRSST, 2014, 17 pages.

DUGUAY P., PRUD'HOMME P., BOUCHER A., *Statistiques sur mesure — Au travail, les hommes se blessent-ils plus que les femmes ?,* DS-006, Montréal, IRSST, 2014, 8 pages.

DUGUAY, P. BOUCHER A., BUSQUE, M.-A., PRUD'HOMME, P., *Indicateurs de lésions professionnelles — Méthodologie,* DS-007, Montréal, IRSST, 2014, 8 pages.

OUR LABORATORIES

ELECTRON MICROSCOPY

Offering a work environment with state-of-the-art equipment is another way of attracting new talent and retaining and further motivating current staff. In this respect, 2014 marked the start of a new era for the Laboratory Division: an era featuring the addition of transmission electron microscopy (TEM). The Board of Directors authorized the purchase of this cutting-edge equipment following a detailed presentation that supported the pertinence of doing so. It also provided a qualitative and quantitative assessment of the current and future costs of electron microscopy analyses according to different scenarios.

A study conducted by an external expert concluded that such an acquisition was economically viable, even without factoring in strategic advantages such as the development of expertise, quality of analyses, and researcher motivation. Without such equipment, the IRSST is obliged to rent usage time and subcontract its analyses to American laboratories since its own equipment is not powerful enough to detect miniscule mineral fibres in lung tissues, do a chemical analysis of them, produce images of electron diffraction patterns, or confirm the presence of fibres in bulk materials.

The TEMs of three manufacturers were evaluated using three criteria:

1. Performance in terms of capacity to identify the chemical structure of various types of fibres, resolution of the electron diffraction images, and contrast and sharpness of the images
2. Capacity to produce an analysis of fibres in lung tissue
3. Capacity to analyze nanoparticles using electron microscopy.

After completing its evaluation, the Institute selected a 200 kV model based on its excellent performance.

Jacinthe Boisvert examines a sample using a microscope.

A NEW LABORATORY

The IRSST's scientists now have access to a new laboratory under a 10-year partnership agreement signed with Université du Québec à Montréal (UQAM). It concerns the joint use of the controlled environment laboratory of the university's Kinanthropology Department.

In this laboratory, temperatures can be set between –30 and 40 degrees Celsius and humidity levels adjusted between 20% and 95%. The lab also provides equipment for measuring physiological constraints, among other things. Access to this climate chamber gives the scientists in the Mechanical and Physical Risk Prevention field a significant edge, as one of the field's research orientations is that of taking human factors into account. The researchers are now better placed to evaluate the physiological constraints associated with wearing protective clothing or equipment.

Denis Marchand (UQAM) and Chantal Gauvin (IRSST) overseeing a subject exposed to thermal constraints.

PARTNERSHIPS

In 2014, the IRSST was a signatory to some 40 local, national, and international partnership agreements, including seven new ones signed during the year. These agreements, which have a multiplier effect on the Institute's research capacity, connect it to several OHS research centres around the world, among other organizations. In addition to the renewal of agreements already in place with the Health and Safety Laboratory (HSL) of the United Kingdom, the Institute for Occupational Safety and Health of the German Social Accident Insurance (IFA), and the Institut national de recherche et de sécurité pour la prévention des accidents du travail et des maladies professionnelles (INRS) of France, a new agreement was signed with the National Institute for Occupational Health and Safety (NIOSH) of the United States. This institute is considered one of the most influential OHS centres on the international stage.

Marilyn Fingerhut, John Howard, Marie Larue, John Piacentino, Margaret Kitt, and Paul-Émile Boileau, at the signing of the IRSST-NIOSH agreement in Washington.

IN 2014, THE IRSST WAS A SIGNATORY TO SOME 40 LOCAL, NATIONAL, AND INTERNATIONAL PARTNERSHIP AGREEMENTS, INCLUDING SEVEN NEW ONES SIGNED DURING THE YEAR.

Signed by IRSST president and CEO Marie Larue and NIOSH director John Howard, this agreement of indeterminate length is based on the shared belief that stronger cooperation between the signatories will do more to meet both organizations' needs. The agreement covers a number of activities, including:

- the exploration of research topics of common interest
- exchanges aimed at enhancing the expertise of both organizations' personnel
- the dissemination, transfer, and application of research results
- the sharing and exchange of OHS information resources.

The broad outline of an action plan for carrying out research, scientific outreach, and knowledge transfer activities was developed on subjects such as commercial fishing, methodological approaches for evaluating the cost of occupational injuries, thermal constraints, and exposure to chemical substances.

Other new agreements include the OHS career scholarship program with the Fonds de recherche du Québec, the Canadian AgriSafety Research Program, a master agreement for R&D in textile and protective equipment engineering with CTT Group and Ege University in Turkey, as well as a master partnership agreement with IFA in Germany.

COMMUNICATION

THE 2014 INSTITUTIONAL COLLOQUIUM

In recent years, occupational diseases have caused more deaths in Québec than have industrial accidents, as the number of toxic substances to which workers are exposed continues to rise, the labour force grows older, and the world of work and the way it is organized continue to change. It therefore comes as no surprise that the Scientific Advisory Board chose *Occupational Diseases — Overview, Challenges and Outlook* as the theme for the IRSST's 2014 annual colloquium. Over 200 people (researchers, preventionists, occupational health physicians, employer and worker representatives, and others) keenly interested in this issue responded to the invitation.

Ten presentations were made. Not only did the colloquium provide an overview of occupational diseases here and elsewhere around the world, but it also looked at the challenges faced in prevention and research, difficulties involved in characterizing exposure, proportions of cancers attributable to work, examples of interventions and case management strategies, and the economic consequences of these diseases in Québec.

RENDEZ-VOUS DE LA SCIENCE

In 2014, the IRSST launched the *Rendez-vous de la science* as a new means of communication aimed at ensuring the application of scientific output. These gatherings, which are open to a broad public, provide researchers and professionals with an opportunity to give lectures that showcase the results of research, knowledge transfer, expertise and laboratory activities, among other things. To better target the interested publics, the presentations were grouped by theme. The eight *Rendez-vous* held during the year gave rise to 15 lectures featuring more than 25 speakers. And to attract an even bigger public, the *Rendez-vous* were videotaped and can be seen on the irsst.tv Web site or the IRSST's YouTube page.

Speakers at the 2014 colloquium: Brigitte Roberge, Patrice Duguay, Sabrina Gravel, Georges Toulouse, France Labrèche, Geoffroy Denis, Linn Holness, Elke Schneider, Paul-Émile Boileau, and Marie Larue (Tony Leroux and Martin Lebeau missing from the photo).

SCIENTIFIC OUTREACH ACTIVITIES AND EVENTS

Developed in 2006 to fuel the scientific endeavours of the research fields, the gatherings referred to as scientific outreach activities and events are ongoing throughout the 2013 to 2017 period. Whether in the form of colloquia, seminars, lectures, or formal and informal meetings, these activities and events are proving to be highly rewarding. They convene researchers, but also professionals and practitioners in the prevention network and our partners, to take stock of specific thematic issues, determine research challenges, and enhance programs, or to share methods, new approaches, and study results. These activities and events also provide a forum for inviting researchers who have done little or no work in the OHS field and inspiring them to do so.

The year 2014 saw eight scientific outreach activities and events on the following themes:

1. Industrial ventilation: a way of controlling exposure (Chemical and Biological Hazard Prevention)
2. Gender and musculoskeletal disorders (Sustainable Prevention and Work Environment)
3. Workload and hardship in the daycare sector (Sustainable Prevention and Work Environment)
4. Scholarship holders (Occupational Rehabilitation)
5. OHS issues related to the use of pesticides in Québec agriculture (Chemical and Biological Hazard Prevention and Sustainable Prevention and Work Environment)
6. Prevention of slip-induced falls (Mechanical and Physical Risk Prevention)
7. Occupational rehabilitation of aging workers (Occupational Rehabilitation)
8. Review of the literature on knee osteoarthritis (Occupational Rehabilitation)

VIDEOS – QUIET PLEASE, WE'RE FILMING!

Some 40 videos were added to the irsst.tv Web site. Video output in 2014 represented over 12 hours and 15 minutes of new content that now enhances the Web site's video library. The collection includes numerous recordings of presentations filmed at colloquia, scientific outreach activities and OHS-research related events, and OHS research-related events likely to be of interest to our partners in the prevention network or to employer, worker, and professional associations. Other videos provide practical information or instructions on how to use the sampling and calibration equipment loaned by the Laboratory Division. A search engine is available to locate videos by category (interview, research results presentation, training tools, etc.), event, or research field. All the videos produced can be viewed directly on the irsst.tv Web site or the IRSST's YouTube page.

An IRSST team filming with researcher Louise St-Arnaud.

GRAPHICS AND BRAND IMAGE

With its extensive experience in communications, the Institute adopted its first set of visual standards to better represent its identity, consolidate its brand image, and standardize practices in this regard. The Institute has matured over time, making it important to adopt such standards to maintain coherence and ensure easy recognition of the IRSST. The *Cahier des normes d'identité visuelle* (visual identity standards guide) concerns materials such as printed documents, digital documents, Web sites, and promotional items.

The *Politique d'édition des publications* (editorial guide for publications) was updated simultaneously to better reflect the opportunities offered by new technologies and widening content diversity.

PRÉVENTION AU TRAVAIL MAGAZINE

Published jointly by the CSST and IRSST, *Prévention au travail* magazine was previously hosted on two separate Web sites managed independently by each organization. The two sites merged in 2014 and interested parties can now consult the magazine at a single address: Preventionautravail.com.

The new Web site is intended for anyone who plays a role in OHS. It contains information—pertinent in terms of both quantity and quality—on the prevention of occupational injuries and the contribution of scientific research to this mission.

Home page of the site Prévention au travail.

PUBLIC RELATIONS - PRESENT WHERE IT MATTERS MOST

The IRSST uses a number of other vehicles aside from *Prévention au travail* magazine to affirm its presence and optimize the transfer of its production to its partners. These include Web sites, social networks, publication of reports and an electronic newsletter, video production, colloquia, and lectures by its personnel. The Institute's employees also participate in events specifically targeted for the priority they place on OHS in their programs. The IRSST had an exhibitor stand at the following events in 2014:

- *18e Forum provincial Carrière en chimie* held by Université Laval in Québec City
- *36e Congrès de l'Association québécoise pour l'hygiène, la santé et la sécurité du travail* (AQHSST) in Québec City
- *Forum santé et sécurité au travail* in Québec City
- 45th Annual Conference of the Association of Canadian Ergonomists in Montréal
- *Congrès international francophone des ressources humaines* (CRHA) in Montréal
- *Grand Rendez-vous santé et sécurité du travail* in Montréal.

HUMAN RESOURCES

The true wealth of a research centre resides in the qualifications, rigour, and ingenuity of its scientific and technical personnel. The Finance and Administration Division is responsible for recruiting, staffing, and training, among other things. As at December 31, 2014, the IRSST had 148 employees, including 21 researchers, 45 scientific professionals, and 31 technicians. Seven new employees, including two directors, joined our ranks during the year.

While recruiting technical, professional, and office personnel generally poses little problem, the same cannot be said for researchers and management staff. However, the many recent efforts made to meet this challenge in the context of an aging workforce and the retirement of individuals who, in many cases, have been with the Institute since its inception, are now starting to bear fruit. Taking the new talent pool into account, the average age of our researchers dropped slightly between 2010 and 2014, going from 51 to 49 years of age. The average age for management staff was 54 years in 2014, down from 56 years in 2010.

As is the yearly custom, the IRSST opened its offices and laboratories to trainees. It hosted 35 of them in 2014, including two Bachelor's students, 14 Master's students, four at the doctoral level, five doing postdoctoral training, one technician in multimedia integration, and nine collaborators. The supervision provided by the permanent staff offers all our trainees a form of initiation to, or source of motivation for choosing, occupational health and safety as a discipline or field of activity.

The year 2014 also saw the signing of a new collective agreement with Local 2957 of the Canadian Union of Public Employees (CUPE), which represents the IRSST's employees. The new work contract has a three-year term and will be in effect until January 24, 2017.

Brigitte Blanchette, laboratory technician, with Sylvie Beaugrand, scientific professional.

THE HONOUR ROLL

JACQUES LESAGE, director of the IRSST's Laboratory Division, was awarded the *Prix Reconnaissance* by his *alma mater*, the Faculty of Sciences at Université du Québec à Montréal (UQAM), for his considerable contribution to the development of rigorous methods for chemically analyzing contaminants in the workplace, for his local and international reputation, and for his vital teaching and highly beneficial sharing of his expertise as a man with extensive field experience. Actively involved in training the next generation of scientists, Mr. Lesage is also a well-known expert in the area of isocyanates, substances for which he developed an analytical method that has since become an international standard.

The name of the chemist **DANIEL DROLET** was added to the short list of his current and former IRSST colleagues whose exceptional contributions to the OHS field have earned recognition from the Association québécoise pour l'hygiène, la santé et la sécurité du travail (AQHSST). By naming him the winner of the *Prix Antoine-Aumont*, this association underscored the contributions made by his work and their usefulness for the industrial hygienist community. Among other things, Mr. Drolet has designed numerous computer-based tools, including ProtecPo, Mixie, SATURISK and VEMPire, to facilitate preventionists' tasks. This is not the first time that the high calibre of his scientific endeavours has been applauded, since he was also the first Canadian to have received the prestigious Edward J. Baier Technical Achievement Award from the American Industrial Hygiene Association (AIHA).

An IRSST scholarship recipient doing post-doctoral training at Université de Montréal, **ABDELHAKIM DJEBARA,** was also honoured by the Fondation de l'AQHSST with an award for excellence for his presentation entitled "*Technique de dilution des concentrations de la poussière émise lors de la transformation des matériaux*." It was inspired by his work in industrial hygiene.

The Faculty of Sciences at Université du Québec à Montréal awarded a scholarship of excellence to **SILVIA PUSCASU** for her impressive university track record as a Master's student in chemistry. A trainee at the IRSST since 2013, she developed a new device for sampling methylene diphenyl diisocyanate (MDI) aerosols efficiently and safely and for more accurately quantifying these aerosols and evaluating worker exposure. Ms. Puscasu also merited an award for excellence from the Fondation de l'AQHSST for one of her presentations on this sampler.

Researcher **LUDOVIC TUDURI** was awarded one of two *Bourse 3M* for best presentation by AQHSST for the high-quality paper he delivered at the Association's 2014 annual conference in 2014. He presented the improvements made to SATURISK, an optimized computer-based tool for calculating the service life of respirator cartridges used in equipment protecting against exposure to organic vapours.

It was another IRSST researcher, **LAURENT GIRAUD**, who won the second *Bourse 3M* for best presentation at the AQHSST's annual conference. This was the third time that the scientist, who is associated with the Mechanical and Physical Risk Prevention research field, earned this distinction for lectures on conveyor safety. His presentation was entitled "R*isques mécaniques liés aux convoyeurs de fosse dans les centres de tri de matières recyclables*" (mechanical risks related to pit conveyors in recyclable-waste sorting plants).

A Ph.D. student in experimental medicine at Université Laval, **JASON BOUFFARD** became the first IRSST scholarship recipient to win the monthly *Étudiant-chercheur étoile Award* given by the Fonds de recherche du Québec (FRQ). This honour was bestowed on him to highlight the quality of his scientific research, whose results led to the article "Tonic Pain Experienced during Locomotor Training Impairs Retention Despite Normal Performance during Acquisition," published in *The Journal of Neuroscience*.

The very first doctoral fellowship recipient hosted by the IRSST, French native **FRANÇOIS AUBRY** obtained a major grant from the Fonds de recherche du Québec – Société et Culture for an interdisciplinary project aimed at promoting the continued employment of patient attendants. Shortly therefore, the Institute gave the go-ahead for a research activity on the impact of time-constraint regulation on the uptake of the general principles for moving patients safely (PDSB) among new patient attendants. Mr. Aubry is a co-investigator in this project. The IRSST created the guest postdoctoral fellowship to attract scientists from abroad and induce them to settle in Québec as OHS researchers.

In 2014, two women students won the *Prix Acfas-IRSST*. The first prize, which goes to the student who distinguishes herself for the excellence of her doctoral dissertation, went to **GABRIELLE LEGENDRE** of Université du Québec à Montréal. It underscored her collaboration in a study on strategies for promoting the development and maintenance of occupational health measures in Montreal small businesses hiring immigrant labour. This study served as inspiration for her thesis on the evaluation of knowledge transfer activities.

Occupational therapist **JUDITH ROBITAILLE,** a Master's student at Université de Sherbrooke, received her *Prix Acfas-IRSST* in recognition of the excellence of her thesis on the epidemiology of musculoskeletal pain related to the performance of classical music in students who play a bowed stringed musical instrument.

HEALTH AND SAFETY OF OUR PERSONNEL

The IRSST's occupational health and safety committee had a productive year. Its members convened ten times to continue the work under way, evaluate progress, and initiate new efforts.

The committee adopted a new procedure for verifying prevention needs to ensure the occupational health and safety of IRSST personnel when conducting research. Its purpose is to ensure that all prevention needs have been anticipated and met before an expert assessment, research activity, or project is begun.

In accordance with the procedure monitoring calendar, a toxic substance spill was simulated in the laboratories to refresh employees' memories of the best practices to follow in such circumstances. The levels of sound emitted by the various laboratories were also evaluated with a view to implementing ways to reduce noise levels. One office work station and two laboratory work stations underwent an ergonomic evaluation. Six declarations were recorded in the accident, incident, and first aid register. Two led to an investigation, which resulted in the identification of various corrective and preventive measures to be implemented.

Once again, the Institute's OHS track record was such that its assessment rate at the CSST was lower than the unit rate paid by enterprises operating in the same industry sector.

Acid is deliberately spilled in one of our laboratories.

RESEARCH STEWARDSHIP

Initiated in 2011, the process aimed at improving project management reached maturity in 2014. All steps had previously been applied in a handful of projects and the findings were positive: the process helped improve their design and execution. In 2014, the Research and Expertise Division applied it to 17 projects and activities.

Since 2011, research work conducted by internal researchers and in joint projects, that is, involving both internal and external researchers, has also been subject to the project management improvement process.

In 2014, the procedure was applied to collaborative projects carried out exclusively by external researchers. Given the few projects in this category (only two new ones in 2014), a meeting aimed at improving project management took place when the two projects started up. The experience was appreciated by the researchers.

Also in 2014, the process designer's participation came to an end and two new facilitators were incorporated into the team of facilitators to ensure new talent and the sustainability of this practice.

INFORMATION TECHNOLOGY RESOURCES

With a new director in place, the Information Technologies Department re-examined the institutional project management process and the process for handling IT requests received from personnel. It introduced a new software program that facilitates the inputting and follow-up of requests and incidents and the tracking of our IT inventory. After receiving training, IRSST personnel submitted over 600 requests in three months that were addressed and resolved by the IT team.

All of the IT work stations of the Institute's employees were migrated to a new operating system, Windows 7. This entailed replacing most computers and reinstalling all the software on the new machines. Begun in 2014, the process of migrating equipment controllers will continue in 2015, depending on the availability of special peripheral drivers designed for laboratory equipment.

The coming into force of Canada's anti-spam legislation (CASL) on July 1, 2014 obliges businesses and institutions to modify, among other things, their policy on computer and Internet use to provide clearer guidelines for the mass mailing of electronic messages to lists of recipients. The IRSST complied with the new legislative requirements by putting into place the tools and processes necessary to meet the various divisions' needs (e.g. issuing news releases or sending out invitations or publications). It also took the opportunity to update its mailing lists.

Lastly, the IRSST issued a public call for tenders with a view to awarding a contract for hosting its Web site and satellite sites and delivering services related to the infrastructures required to use the Internet.

Roxanne Mongeau, director.

FINANCIAL AND PHYSICAL RESOURCES

Sophie Thibault, director.

Sophie Thibault took up her post as director of the Financial and Physical Resources Department in 2014, where she is entrusted with the task of overseeing the smooth running of financial and accounting operations.

She immediately undertook to optimize the financial and accounting management systems, revise financial processes, and implement the revised processes to ensure that internal controls are put in place, that activities are appropriately divided up among resources, and that they are managed efficiently.

GOVERNANCE

BOARD OF DIRECTORS' VISIT

On November 21, the IRSST welcomed the members of its Board of Directors for a tour of the premises. The Board held its regular meeting at the IRSST and then took the opportunity to visit some of the laboratories. Employer and worker representatives were able to see the biomechanical laboratory in operation first-hand and thus gain a better understanding of its usefulness in studying manual material handling and preventing the related occupational injuries. They also attended short presentations showcasing the expertise of the personnel of the mass spectrometry and asbestos analysis laboratories. The visit gave the Board members a chance to see the services offered to Québec workers and employers in context, while establishing real links between the laboratories' role and workplaces' concerns regarding prevention and industrial hygiene.

Carmel Laflamme, Yves-Thomas Dorval, Françoise Bertrand, France Dupéré, Claude Sicard, and Mireille Cholette.

François Hébert, Yves Ouellet, Lucie Levasseur, and Claude Faucher.

BOARD OF DIRECTORS AND SCIENTIFIC ADVISORY BOARD

The composition of the Institute's governing bodies varied during the year with departures and appointments. On behalf of all IRSST personnel, the president and CEO would like to welcome the newcomers to the Board of Directors and the Scientific Advisory Board, and offer them all the support they need to accomplish their mission. She also wishes to express her great appreciation to Simon Prévost, who left the Board of Directors, and to Micheline Boucher, Daniel Flynn, Yves Rousseau, Sinarith Heng, and Pierre Galarneau for their laudable contributions to the work of the Scientific Advisory Board.

BOARD OF DIRECTORS

The Board of Directors determines the IRSST's orientations, development framework, and financing. It is a labour/management body composed of the chair and seven representatives each of employer and work associations. In 2014, the members of the Board of Directors held seven meetings, as did those of the Executive Committee.

CHAIR
Michel Després*

WORKER REPRESENTATIVES
Andrée Bouchard
Serge Cadieux*
Claude Faucher
Jean Lacharité
Lucie Levasseur
Yves Ouellet
Daniel Roy

EMPLOYER REPRESENTATIVES
Françoise Bertrand
Yves-Thomas Dorval*
France Dupéré
Martine Hébert
Patricia Jean
Carmel Laflamme
Vacancy

OBSERVER
Suzanne Thérien

IRSST REPRESENTATIVE
Marie Larue

DEPARTURE
Simon Prévost

* Member of the Executive Committee

SCIENTIFIC ADVISORY BOARD

A tri-partite advisory body serving the president and CEO, the Scientific Advisory Board (SAB) judges the relevance, priority, and scientific merit of internal research programs and projects. The SAB is composed of the Institute's president and CEO, six members of the scientific and technical community, four worker representatives, and four employer representatives. In 2014, the members of the SAB met eight times.

CHAIR
Marie Larue

WORKER REPRESENTATIVES
Lionel Bernier
Dominique Malo
Marie-France Turcotte
Poste vacant

EMPLOYER REPRESENTATIVES
Jean Dussault
Denis Mailloux
Ana Maria Seifert
Vacancy

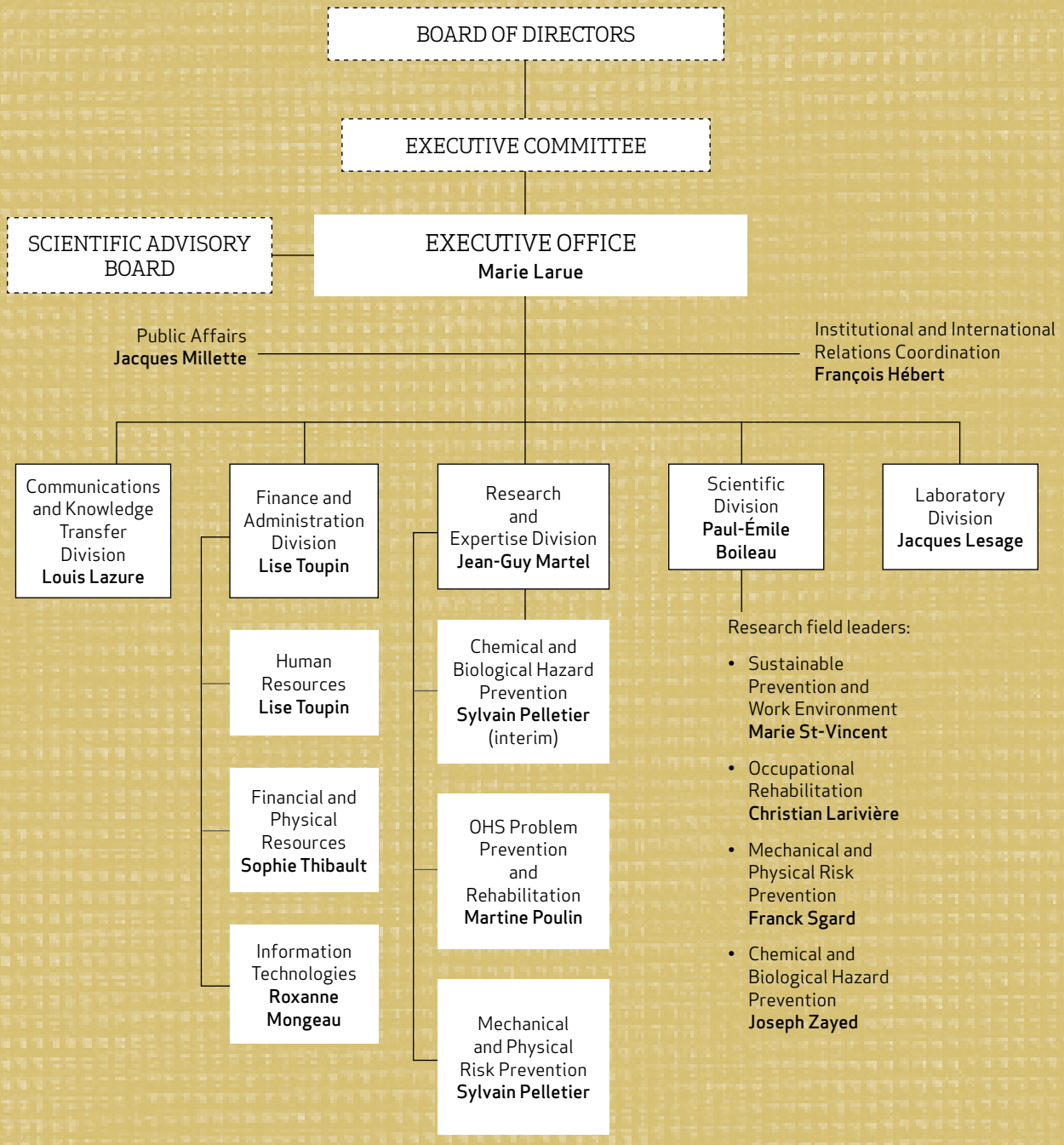
MEMBERS OF THE SCIENTIFIC AND TECHNICAL COMMUNITY
Léonard Aucoin
André Dufresne
Louis Cloutier
Benoit Lévesque
Louise Dandurand
Alain Rondeau

OBSERVER
Claude Sicard

APPOINTMENTS
Louise Dandurand, Ana Maria Seifert, Sinarith Heng, Louis Cloutier, Benoit Lévesque, André Dufresne

DEPARTURES
Micheline Boucher, Daniel Flynn, Yves Rousseau, Sinarith Heng, Pierre Galarneau

ORGANIZATION CHART



FINANCIAL POSITION

AS AT DECEMBER 31, 2014

REVENUES $26,080,712

EXPENDITURES $25,757,305

MOST POPULAR **PUBLICATIONS**

MOST POPULAR 2014 FRENCH PUBLICATIONS[1]

1. *Santé mentale au travail — Projet-pilote pour passer d'une approche individuelle de réadaptation à une approche organisationnelle de prévention*, R-807, Louise St-Arnaud, Marième Pelletier, Michel Vézina, Catherine Briand, Pascal Paillé, Émélie Demers, 2014.

2. *Chariot élévateur — Comment choisir la ceinture de sécurité*, RF-800, Sylvie Beaugrand, Christian Larue, Denis Rancourt, 2014.

3. *Les facteurs influençant le retour au travail après une dépression — Le point de vue et le rôle des acteurs syndicaux*, R-805, Marc Corbière, Louise St-Arnaud, Marie-José Durand, Marie-France Coutu, Tania Lecomte, Alessia Negrini, Marianne Renard, 2014.

4. *Cinématique et modélisation biomécanique de l'épaule lors de tâches de manutention*, R-828, Landry Desmoulins, Benjamin Michaud, Paul Allard, André Plamondon, Mickaël Begon, 2014.

5. *La santé et la sécurité du travail dans les centres de formation professionnelle — La prévention, un projet collectif*, RF-802, Céline Chatigny, Aurélie Tondoux, 2014.

6. *Nanomatériaux — Guide de bonnes pratiques favorisant la gestion des risques en milieu de travail, 2e édition*, R-840, Claude Ostiguy, Maximilien Debia, Brigitte Roberge, André Dufresne, 2014.

7. *Développement d'un indice radiologique représentatif de la fonction de l'épaule chez des travailleurs souffrant de rupture de la coiffe des rotateurs*, R-812, Nicola Hagemeister, Pierre-Yves Lagacé, Joan Hereter Gregori, Laurence Marck, Dominique Rouleau, Nathalie Bureau, Patrice Tétreault, André Roy, Fidaa Al-Shakfa, 2014.

8. *Méthodes de simulation temporelles pour résoudre des problématiques de bruit et vibrations — Revue de la littérature*, R-806, Celse Kafui Amédin, Noureddine Atalla, Franck Sgard, 2014.

9. *Bilan des connaissances sur les facteurs de risque de l'arthrose du genou et sur les outils d'évaluation et les interventions en matière de soins et services*, R-832, Nathaly Gaudreault, Marie-José Durand, Hélène Moffet, Luc Hébert, Nicola Hagemeister, Debbie Feldman, Michael Bernier, Karine Genest, Sylvain Laprise, Anne-Catherine Maynard-Paquette, 2014.

10. *Utilisation sécuritaire des fontaines biologiques de dégraissage*, RF-829, Denis Bégin, Michel Gérin, Jacques Lavoie, 2014.

[1] Most frequently downloaded publications, in decreasing order.

MOST POPULAR 2014 ENGLISH PUBLICATIONS

1. *Planning Tool for Safe Manual Handling*, RF-816, Monique Lortie, Marie St-Vincent, 2014.

2. *Guide to an Integrated Practices Program for Supporting a Return to Work and Promoting Job Retention – Facilitating an Employee's Return to Work following an Absence for a Mental Health Problem*, RG-813, Louise St-Arnaud, Marième Pelletier, 2014.

3. *Supporting a Return to Work after an Absence for a Mental Health Problem: Design, Implementation, and Evaluation of an Integrated Practices Program*, R-823, Louise St-Arnaud, Catherine Briand, Marc Corbière, Marie-José Durand, Renée Bourbonnais, Micheline Saint-Jean, Marième Pelletier, Stéphanie Delisle, Evelyn Kedl, 2014.

4. *Biomechanical and Ergonomic Impacts of Handling in Obese Workers*, R-825, Philippe Corbeil, André Plamondon, Normand Teasdale, Grant Handrigan, Jasmin Ten Have, Nancy Manzerolle, 2014.

5. *Carcinogenic Substances – Exposure Profile of Quebec Workers*, R-830, France Labrèche, Patrice Duguay, Claude Ostiguy, Nicole Goyer, Alexandre Boucher, Brigitte Roberge, Marc Baril, 2014.

6. *Biomechanics and Ergonomics in Women Material Handlers*, R-808, André Plamondon, Denys Denis, Christian Larivière, Alain Delisle, Denis Gagnon, Marie St-Vincent, Iuliana Nastasia, 2014.

7. *Thermal Stress and Chemicals – Knowledge Review and the Highest Risk Occupations in Québec*, R-834, Ginette Truchon, Joseph Zayed, Robert Bourbonnais, Martine Lévesque, Mélyssa Deland, Marc-Antoine Busque, Patrice Duguay, 2014.

8. *The Costs of Occupational Injuries in Québec, 2005-2007*, R-843, Martin Lebeau, Patrice Duguay, Alexandre Boucher, 2014.

9. *Estimating the Number of Cases of Occupational Cancer in Quebec*, R-836, France Labrèche, Patrice Duguay, Alexandre Boucher, Robert Arcand, 2014.

10. *Evaluation of the Implementation and Impact of the PRÉVICAP Program*, R-810, Michèle Rivard, Jean-Louis Denis, André-Pierre Contandriopoulos, Michel Rossignol, Henriette Bilodeau, Geneviève Ste-Marie, Valérie Lederer, 2014.

MOST POPULAR PUBLICATIONS IN THE PAST FIVE YEARS

1. *Sampling Guide for Air Contaminants in the Workplace,* T-15, Daniel Drolet, Guylaine Beauchamp, 2012.

2. *Guide to an Integrated Practices Program for Supporting a Return to Work and Promoting Job Retention,* RG-813, Louise St-Arnaud, Marième Pelletier, 2013.

3. *Participatory Training in Manual Handling – Theoretical Foundations and Proposed Approach,* R-784, Denys Denis, Monique Lortie, Marie St-Vincent, Maud Gonella, André Plamondon, Alain Delisle, Jacques Tardif, 2011.

4. *Plannng Tool for Safe Manual Handling,* RF-816, Monique Lortie, Marie St-Vincent, 2013.

5. *Québec Survey on Working and Employment Conditions and Occupational Health and Safety (EQCOTESST) – Summary,* RR-707 , Michel Vézina, Esther Cloutier, Susan Stock, Katherine Lippel, Éric Fortin, Alain Delisle, Marie St-Vincent, Amélie Funes, Patrice Duguay, Samuel Vézina, Pascale Prud'homme, 2011.

6. *Procédure d'intégration professionnelle à l'usage du conseiller en réadaptation (Échelles de restriction)*, B-023, Claire Lapointe, 1991.

7. *Enquête québécoise sur des conditions de travail, d'emploi et de SST (EQCOTESST)*, R-691, Michel Vézina, Esther Cloutier, Susan Stock, Katherine Lippel, Éric Fortin, Alain Delisle, Marie St-Vincent, Amélie Funes, Patrice Duguay, Samuel Vézina, Pascale Prud'homme, 2011.

8. *Guide de surveillance biologique de l'exposition*, T-03, Ginette Truchon, Robert Tardif, Jérôme Lavoué, Daniel Drolet, Martine Lévesque, Julie Boucher, 2012.

9. *Guide for Safe Use of Isocyanates – An Industrial Hygiene Approach,* RG-773, Brigitte Roberge, Simon Aubin, Claude Ostiguy, Jacques Lesage, 2013.

10. *Guide pour une démarche stratégique de prévention des problèmes de santé psychologique au travail*, RG-618, Jean-Pierre Brun, Caroline Biron, France St-Hilaire, 2009.

SCIENTIFIC **PUBLICATIONS**

PEER-REVIEWED JOURNAL ARTICLES

ADAM-POUPART A., SMARGIASSI A., BUSQUE M.-A., DUGUAY P., FOURNIER M., ZAYED J., LABRÈCHE F. *Summer outdoor temperature and occupational heat-related illnesses in Québec (Canada)*. Environmental Research, vol. 134, 2014, p. 339-344.

ALIMONTI L., ATALLA N., BERRY A., SGARD F. *Assessment of a hybrid finite element-transfer matrix model for flat structures with homogeneous acoustic treatments*. Journal of the Acoustical Society of America, vol. 135, nº 5, 2014, p. 2694-2705.

BAHLOUL A., MAHDAVI A., HAGHIGHAT F., OSTIGUY C. *Evaluation of N95 filtering facepiece respirator efficiency with cyclic and constant flows*. Journal of Occupational and Environmental Hygiene, vol. 11, nº 8, 2014, p. 499-508.

BAKHIYI B., LABRÈCHE F., ZAYED J. *The photovoltaic industry on the path to a sustainable future - Environmental and occupational health issues*. Environment International, vol. 73, 2014, p. 224-234.

BOIVIN D. B., BOUDREAU P. *Impacts of shift work on sleep and circadian rhythms*. Pathologie biologie, vol. 62, nº 5, 2014, p. 292-301.

BOUDREAULT J., DESMEULES F., ROY J. S., DIONNE C. E., FRÉMONT P., MACDERMID J. C. *The efficacy of oral non-steroidal anti-inflammatory drugs for rotator cuff tendinopathy : a systematic review and meta-analysis*. Journal of Rehabilitation Médicine, vol. 46, nº 4, 2014, p. 294-306.

BOULANGER G., ANDUJAR P., PAIRON J.-C., BILLON-GALLAND M.-A., DION C., DUMORTIER P., BROCHARD P., SOBASZEK A., BARTSCH P., PARIS C., JAURAND M.-C. *Quantification of short and long asbestos fibers to assess asbestos exposure : a review of fiber size toxicity*. Environmental Health, vol. 13, nº 59, 2014, 18 p.

BOYER S., DOUTRES O., SGARD F., LAVILLE F., BOUTIN J. *Objective assessment of the sound paths through earmuff components*. Applied Acoustics, vol. 83, 2014, p. 76-85.

BRUMMUND M. K., SGARD F., PETIT Y., LAVILLE F. *Three-dimensional finite element modeling of the human external ear : simulation study of the bone conduction occlusion effect*. Journal of the Acoustical Society of America, vol. 135, nº 3, 2014, p. 1433-1444.

BURLET-VIENNEY D., CHINNIAH Y., PIZARRO-CHONG A. *Design of an intelligent tool for the observation and follow-up of lockout procedures during maintenance activities on industrial machines*. Open Journal of Safety Science and Technology, vol. 4, nº 2, 2014, p. 106-118.

BURLET-VIENNEY D., CHINNIAH Y., BAHLOUL A. *The need for a comprehensive approach to managing confined space entry : summary of the literature and recommendations for next steps*. Journal of Occupational and Environmental Hygiene, vol. 11, nº 8, 2014, p. 485-498.

CÔTÉ D. *La réadaptation au travail des personnes issues de l'immigration et des minorités ethnoculturelles : défis, perspectives et pistes de recherche*. Pistes (Perspectives interdisciplinaires sur le travail et la santé), vol. 16, nº 2, 2014, 19 p.

DEBIA M., WEICHENTHAL S., DUFRESNE A. *Ultrafine particles exposure in apprentice welders*. Journal of Occupational and Environmental Hygiene, 2014, vol. 11, nº 1, p. D1-D9.

DESROSIERS J., VIAU-GUAY A., BELLEMARE M., TRUDEL L., FEILLOU I., GUYON A. C. *Relationship-based care and behaviours of residents in long-term care facilities*. Current Gerontology and Geriatrics Research, vol. 2014, 2014, 8 p.

EL OUAAID Z., SHIRAZI-ADL A., PLAMONDON A. *Effect of changes in orientation and position of external loads on trunk muscle activity and kinematics in upright standing*. Journal of Electromyography and Kinesiology, vol. 24, nº 3, 2014, p. 387-393.

EL OUAAID Z., SHIRAZI-ADL A., PLAMONDON A., ARJMAND N. *Elevation and orientation of external loads influence trunk neuromuscular response and spinal forces despite identical moments at the L5-S1 level*. Journal of Biomechanics, vol. 47, nº 12, 2014, p. 3035-3042.

FOURNIER P., SCHÖNWIESNER M., HÉBERT S. *Loudness modulation after transient and permanent hearing loss : implications for tinnitus and hyperacusis*. Neuroscience, vol. 283, 2014, p. 64-77.

GAUDREAULT N., MAILLETTE P., COUTU M.-F., DURAND M.-J., HAGEMEISTER N., HÉBERT L. J. *Work disability among workers with osteoarthritis of the knee: risk factors, assessment scales, and interventions*. International Journal of Rehabilitation Research, vol. 37, nº 4, 2014, p. 290-296.

GIBBS G. W., LABRÈCHE F., BUSQUE M.-A., DUGUAY P. *Mortality and cancer incidence in aluminum smelter workers : A 5-year update*. Journal of Occupational and Environmental Medicine, vol. 56, nº 7, 2014, p. 739-764.

GIBBS G. W., LABRÈCHE F. *Cancer risks in aluminum reduction plant workers : A review*. Journal of Occupational and Environmental Medicine, vol. 56, nº 5S, 2014, p. S40-S59.

GIRARD D. *Using the air pouch model for assessing in vivo inflammatory activity of nanoparticles*. International Journal of Nanomedicine, vol. 9, 2014, p. 1105-1109.

GONCALVES D. M., GIRARD D. *Zinc oxide nanoparticles delay human neutrophil apoptosis by a de novo protein synthesis-dependent and reactive oxygen species-independent mechanism*. Toxicology in Vitro, vol. 28, 2014, p. 926-931.

HAJRA B., STATHOPOULOS T., BAHLOUL A. *Performance of ASHRAE models in assessing pollutant dispersion from rooftop emissions*. HVAC&R Research, vol. 20, no 1, 2014, p. 72-79.

HEGG-DELOYE S., BRASSARD P., JAUVIN N., PRAIRIE J., LAROUCHE D., POIRIER P., TREMBLAY A., CORBEIL P. *Current state of knowledge of post-traumatic stress, sleeping problems, obesity and cardiovascular disease in paramedics*. Emergency Medicine Journal, vol. 31, nº 3, 2014, p. 242-247.

HEGG-DELOYE S., BRASSARD P., PRAIRIE J., LAROUCHE D., JAUVIN N., TREMBLAY A., CORBEIL P. *Portrait global de l'exposition aux contraintes psychosociales au travail des paramédics québécois*. Pistes (Perspectives interdisciplinaires sur le travail et la santé), vol. 16, no 3, 2014, 18 p.

HEGG-DELOYE S., CORBEIL P., BRASSARD P., PRAIRIE J., LAROUCHE D., JAUVIN N., CARMICHAEL P. H., POIRIER P., TREMBLAY A. *Work-related and dietary factors associated with weight gain over the period of employment in paramedics*. Occupational Medicine and Health Affairs, vol. 2, nº 4, 2014, 7 p.

JALEEL A., AHMED B., TAFRESHI R., BOIVIN D. B., STRELETZ L., HADDAD N. *Improved spindle detection through intuitive pre-processing of electroencephalogram*. Journal of Neuroscience Methods, vol. 233, 2014, p. 1-12.

JOCELYN S., BAUDOIN J., CHINNIAH Y., CHARPENTIER P. *Feasibility study and uncertainties in the validation of an existing safety-related control circuit with the ISO 13849-1 : 2006 design standard*. Reliability Engineering & System Safety, vol. 121, 2014, p. 104-112.

LABERGE L., LEDOUX É., AUCLAIR J., GAUDREAULT M. *Determinants of sleep duration among high school students in part-time employment*. Mind, Brain, and Education, 2014, vol. 8, nº 4, p. 220-226.

LARIVIÈRE C., GENEST K., GAGNON D. *Controlling for out-of-plane lumbar moments during unidirectional trunk efforts : Learning and reliability issues related to trunk muscle activation estimates*. Journal of Electromyography and Kinesiology, vol. 24, nº 1, 2014, p. 531-541.

LARIVIÈRE C., CARON J.-M., PREUSS R., MECHERI H. *The effect of different lumbar belt designs on the lumbopelvic rhythm in healthy subjects*. BMC Musculuskeletal Disorders, vol. 15, nº 307, 13 p.

LEBEAU M., DUGUAY P., BOUCHER A. *Costs of occupational injuries and diseases in Québec*. Journal of Safety Research, vol. 50, 2014, p. 89-98.

LEGENDRE G., GRAVEL S., RHÉAUME J. *Les comités de santé et sécurité au travail (SST) dans les petites entreprises (PE) montréalaises embauchant une main-d'œuvre immigrante*. Pistes (Perspectives interdisciplinaires sur le travail et la santé), vol. 16, nº 2, 2014, 14 p.

LÉVESQUE S., PLANTE P.L., MENDIS N., CANTIN P., MARCHAND G., CHAREST H., RAYMOND F., HUOT C., GOUPIL-SORMANY I., DESBIENS F., P. FAUCHER S., CORBEIL J., TREMBLAY C. *Genomic Characterization of a Large Outbreak of Legionella pneumophila Serogroup 1 Strains in Quebec City, 2012* PloS. One, vol. 9, nº 8, 2014, p. 1-10.

MAHDAVI A., BAHLOUL A., HAGHIGHAT F., OSTIGUY C. *Contribution of breathing frequency and inhalation flow rate on performance of N95 filtering facepiece respirators*. Annals of Occupational Hygiene, vol. 58, nº 2, 2014, p. 195-205.

MANKOVSKI-ARNOLD T., WIDEMAN T.H., LARIVIÈRE C., SULLIVAN M. J. *Measures of spontaneous and movement-evoked pain are associated with disability in patients with whiplash injuries*. The Journal of Pain, vol. 15, nº 9, 2014, p. 967-975.

NASTASIA I., COUTU M.-F., TCACIUC R. *Topics and trends in research on non-clinical interventions aimed at preventing prolonged work disability in workers compensated for work-related musculoskeletal disorders (WRMSDs) : a systematic, comprehensive literature review*. Disability and Rehabilitation, vol. 36, nº 22, 2014, p. 1841-1856.

NEGRINI A., CORBIÈRE M., FORTIN G., LECOMTE T. *Psychosocial well-being construct in people with severe mental disorders enrolled in supported employment programs*. Community Mental Health Journal, vol. 50, nº 8, 2014, p. 932-942.

NEGRINI A., PERRON J., CORBIÈRE M. *The predictors of absenteeism due to psychological disability : a longitudinal study in the education sector*. Work : A Journal of Prevention, Assessment & Rehabilitation, vol. 48, nº. 2, 2014, p. 175-184.

NIEDERSTRASSER N. G., SLEPIAN P. M., MANKOVSKI-ARNOLD T., LARIVIÈRE C., VLAEYEN J., SULLIVAN M. J. *An experimental approach to examining psychological contributions to multisite musculoskeletal pain*. The Journal of Pain, vol. 15, nº 11, 2014, p. 1156-1165.

PASSERON J., TRUCHON G., PILLIÈRE F., HOET P., BERODE M., BIJAOUI A., SAGER A., DETORRENTÉ A., GAGNON M., VADNAIS G. *Veille bibliographique sur la surveillance biologique de l'exposition aux produits chimiques au poste de travail. L'expérience d'un réseau francophone multidisciplinaire*. Références en santé au travail, nº 138, 2014, p. 47-68.

PLAMONDON A., DELISLE A., BELLEFEUILLE S., DENIS D., GAGNON D., LARIVIÈRE C. et al. *Lifting strategies of expert and novice workers during a repetitive palletizing task*. Applied Ergonomics, vol. 45, nº 3, 2014, p. 471-481.

PLAMONDON A., LARIVIÈRE C. , DENIS D. , ST-VINCENT M., DELISLE A. *Sex differences in lifting strategies during a repetitive palletizing task*. Applied Ergonomics, vol. 45, nº 6, 2014, p. 1558-1569.

POIRIER M., SIMARD J.-C., ANTOINE F., GIRARD D. *Interaction between silver nanoparticles of 20 nm (AgNP20) and human neutrophils : induction of apoptosis and inhibition of de novo protein synthesis by AgNP20 aggregates*. Journal of Applied Toxicology, vol., 34, nº 4, 2014, p. 404-412.

PRAIRIE J., CORBEIL P. *Paramedics on the job : dynamic trunk motion assessment at the workplace*. Applied Ergonomics, vol. 54, nº 4, 2014, p. 895-903.

PUSCASU S., AUBIN S., VAN TRA H., GAGNÉ S. *Adaptation of CIP10 for the sampling of 4,4'-methylene diphenyl diisocyanate aerosols*. Analytical Methods, nº 6, 2014, p. 1101-1107.

SAINT-ARNAUD L., MARCHE-PAILLE A., TOULOUSE G. *Les métiers de l'urgence : des stratégies défensives au-delà du genre*. Archives des maladies professionnelles et de l'environnement, vol. 75, nº 5, 2014, p. 478-494.

SCHIEFER C., ELLEGAST R. P., HERMANNS I., KRAUS T., OCHSMANN E., LARUE C., PLAMONDON A. *Optimization of inertial sensor-based motion capturing for magnetically distorted field applications*. Journal of Biomechanical Engineering, vol. 136, nº 12, 2014, 8 p.

SHAHVARPOUR A., SHIRAZI-ADL A., MECHERI H., LARIVIÈRE C. *Trunk response to sudden forward perturbations - Effects of preload and sudden load magnitudes, posture and abdominal antagonistic activation*. Journal of Electromyography and Kinesiology, vol. 24, nº 3, 2014, p. 394-403.

TOLIOPOULOS P., DESMEULES F., ROY J. S., DIONNE C. E., FRÉMONT P., MACDERMID J. C. *Efficacy of surgery for rotator cuff tendinopathy : a systematic review*. Clinical Rheumatology, vol. 33, nº 10, 2014, p. 1373-1383.

MASTER'S THESES AND DOCTORAL DISSERTATIONS

BABIN K. *Effet modulatoire des nanoparticules de Ti02, CeOe et ZnO sur la dégranulation chez les neutrophiles humains*. Mémoire de maîtrise, Laval, INRS-Institut Armand-Frappier, 2014.

LANDRY J. *Les équipements de protection individuelle en agriculture : comparaison des contextes normatifs et législatifs nord-américain et européen*. Mémoire de maîtrise, Montréal, Université de Montréal, 2014.

MAYANK K. *Development and assessment of a coupling force measurement system applied to stationary and vibrating tool handles*. Mémoire de maîtrise, Montréal, Université Concordia, 2014.

OPIMBA R.-M. *Efficacité du dénombrement des cellules sécrétrices d'inferféron-gamma et d'interleukine 2 pour la détection d'une sensibilisation chez des travailleurs exposés au béryllium*. Mémoire de maîtrise, Laval, INRS-Institut Armand-Frappier, 2014.

BOOK CHAPTERS

CÔTÉ D., GRATTON D. *L'approche ethnographique : illustration dans le contexte de la réadaptation en santé mentale*. *in* Méthodes qualitatives, quantitatives et mixtes dans la recherche en sciences humaines, sociales et de la santé, Corbière, M., Larivière, N. (éds.), Presses de l'Université du Québec, 2014, p. 51-72.

FEILLOU I., BELLEMARE M., VIAU-GUAY A., TRUDEL L., DESROSIERS J., ROBITAILLE M.-J. *Le soin relationnel en CHSLD : De la formation à l'approche relationnelle de soins, à la réalité du travail des préposés aux bénéficiaires*. *in* Préposés aux bénéficiaires et aides-soignantes : entre domination et autonomie, Aubry, F., Couturier, Y. (éds), Québec, Presses de l'Université du Québec, 2014, p. 51-71 (collection santé et société).

LABRÈCHE F., GOLDBERG M. S., WEIDERPASS E. *Breast cancer*. *in* Occupational Cancers, Anttila, S., Boffetta, P., (eds), Springer, 2014, p. 391-408.

NEGRINI A., PERRON J., PERRON B. *Analyse de classification par regroupement. Description et application à une problématique d'équilibre travail-famille et de détresse psychologique*. *in* Méthodes qualitatives, quantitatives et mixtes dans la recherche en sciences humaines, sociales et de la santé, Corbière, M., Larivière, N. (éds.), Presses de l'Université du Québec, 2014, p. 327-352.

PEER-REVIEWED ARTICLES PUBLISHED IN CONFERENCE PROCEEDINGS (2014)

BURLET-VIENNEY D., CHINNIAH Y., BAHLOUL A., ROBERGE B. *Maîtrise des risques lors des interventions en espace confiné au Québec. in* Décider dans un monde incertain : enjeu majeur de la maîtrise des risques : Lambda Mu 19, (19e : 21-23 octobre, 2014 : Dijon, France), 2014, 7 p.

DEWANGAN K. N., RAKHEJA S., MARCOTTE P. *Gender effect on absorbed power of seated body to vertical whole body vibration. in* American Conference on Human Vibration : Proceedings of the 5th American Conference on Human Vibration, (5th : June 10-13, 2014 : Ontario, Canada), Oliver, M. (ed.), 2014, p. 4-5.

FALAKNAZ N., AUBERTIN M., LI L. *A numerical modelling study to assess the stress distribution in two nearby backfilled openings created in sequence. in* L'ingénierie des conditions extrêmes : GéoRegina 2014 : Conférence canadienne de géotechnique, (67e : 28 septembre-1er octobre, 2014 : Regina, Canada), 2014, 7 p.

LABERGE L., LEDOUX É., AUCLAIR J., ARBOUR N., GAUDREAULT M. *Exposure to higher physical work demands is associated with shorter sleep duration in high school students combining study with paid work. in* Annual Meeting of the Associated Professional Sleep Societies / Sleep 2014, (28th : May 31-June 4, 2014, Minneapolis, Minnesota, USA), 2014, vol. 37, p. A310-A311.

LI L. *A numerical analysis of the application of wick drains for continuous backfilling in mine backfilled stopes. in* Geosynthetics Mining Solutions 2014, (September 8-11, 2014 : Vancouver, Canada), Proceedings of Geosynthetics Mining Solutions, Caldwell, J., Goodwill, J. (eds), InfoMine, 2014, p. 369-382.

LORTIE M., VEZEAU S., GOWINGS T., FATISSON J., NADEAU S., KEFI I., CHAOUCH F. *Holistic sustainable development : floor-laying workers' case. in* International Symposium on Human Factors in Organizational Design and Management & Annual Nordic Ergonomics society Conference, (11th : 46th : August 17-20, 2014 : Copenhagen, Denmark), Human Factors in Organizational Design and Management - XI : Nordic ergonomics Society Annual Conference - 46, Broberg, O., Fallentin, N., Hasle, P., Jensen, P.L. ; Kabel, A., Larsen, M.E., Weller, T. (eds.), 2014, vol. 1, p. 171-176.

MARCOTTE P., RAKHEJA S., KALRA M., DEWANGAN K. N. *Evaluation of coupling forces on power tool handles using a thin film resistive pressure sensor. in* American Conference on Human Vibration : Proceedings of the 5th American Conference on Human Vibration, (5th : June 10-13, 2014 : Ontario, Canada), Oliver, M. (ed.), 2014, p. 45-46.

NOËL A., CLOUTIER Y., CHARBONNEAU M., MAGHNI K., TARDIF R., TRUCHON G. *Inhaled nano-TiO_2 : exposure metrics and dose-response relationship. in* Annual Meeting of the Society of Toxicology, (53rd, March 23-27, 2014, Phoenix, USA), The Toxicologist, vol. 138, no 1, p. 214.

SGARD F. , BRUMMOND M., VIALLET G., BOYER S., DOUTRES O., NÉLISSE H. , LAVILLE F., PETIT Y., BOUTIN J. *Prediction of airborne and structure borne sound transmission through hearing protectors using FEM. in* Improving the World through Noise Control : International congress on Noise Control Engineering / InterNoise 2014 (43rd : November 16-19, 2014 : Melbourne, Australia), 2014, 9 p.

SOBHI M. A., LI L., AUBERTIN M. *Numerical investigation of the lateral earth pressure coefficient along the VCL of vertical backfilled stopes. in* L'ingénierie des conditions extrêmes : GéoRegina 2014 : Conférence canadienne de géotechnique, (67e : 28 septembre-1er octobre, 2014 : Regina, Canada), 2014, 8 p.

VIALLET G., SGARD F., LAVILLE F., BOUTIN J. *A finite element model to predict the sound attenuation of earplugs in an acoustical test fixture. in* The Journal of the Acoustical Society of America, vol. 136, no 3, 2014, p. 1269-1280.

YANG P., LI L. *A 3D analytical solution for the short-term stress distribution in backfilled stopes and on barricades. in* L'ingénierie des conditions extrêmes : GéoRegina 2014 : Conférence canadienne de géotechnique, (67e : 28 septembre-1er octobre, 2014 : Regina, Canada), 2014, 7 p.

YANG P., BROCHU-BAEKELMANS M., LI L., AUBERTIN M. *An improved solution for sizing barricades made of waste rock to retain cemented paste backfill. in* L'ingénierie des conditions extrêmes : GéoRegina 2014 : Conférence canadienne de géotechnique, (67e : 28 septembre-1er octobre, 2014 : Regina, Canada), 2014, 9 p.

MISSION

To contribute, through research, to the prevention of industrial accidents and occupational diseases and to the rehabilitation of affected workers;

To disseminate knowledge and serve as a scientific reference centre and expert;

To provide the laboratory services and expertise required to support the public occupational health and safety network.

To fulfill this mission, the IRSST:

- carries out and funds research in its priority research fields;
- supports the development of research and new knowledge in occupational health and safety, in collaboration with the scientific community;
- disseminates and promotes knowledge generated through research, in both the workplace and scientific communities;
- plays a leadership role in anticipating emerging needs, raising awareness, and creating synergy in the area of occupational health and safety research;
- contributes to researcher training in occupational health and safety;
- provides laboratory services to the CSST and its network;
- contributes to the development of standards and regulations governing occupational health and safety;
- responds to ad hoc requests for specific expertise originating from various occupational health and safety stakeholders.

VISION

Through its leadership in occupational health and safety research, the IRSST seeks to:

- consolidate its role as a reference centre vital to the operations and strategies of the CSST and its network;
- be used by its social partners in a spirit of joint collaboration;
- win recognition at the national and international levels;
- derive maximum benefit from a well-established network of research and development collaborators.

PRODUCTION
Communications and
Knowledge Transfer Division
Louis Lazure, director

EDITOR
Jacques Millette

COLLABORATION
François Hébert
Louis Lazure
Linda Savoie
Marjolaine Thibeault

COORDINATION
Maura Tomi

GRAPHIC DESIGN
Samarkand

PHOTOS
Pierre Charbonneau
Pierre Cloutier
Dominique Desjardins
Philippe Lemay
Jacques Millette
Nura Sadeghpour
Steve Tozer

TRANSLATION
Leslie Macdonald

IRSST
505 De Maisonneuve Blvd. West
Montréal, Québec
H3A 3C2
Phone: 514 288-1551
Fax: 514 288-7636

ISSN 0820-8409
ISBN 978-2-89631-805-2 (print format)
ISBN 978-2-89631-806-3 (PDF)

Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST)

Institut de recherche
Robert-Sauvé en santé
et en sécurité du travail

WWW.IRSST.QC.CA