Agrivita Canada Inc. and the Canadian AgriSafety Applied Research Program

**Agrivita Canada Inc.** Agrivita Canada Inc. is a national not-for-profit corporation promoting health and safety research and its effective application to the agricultural sector. Agrivita is committed to ensuring farmers and agricultural workers have a standard of occupational health and safety equivalent to other industries.

**Canadian AgriSafety Applied Research Program**

The **Canadian AgriSafety Applied Research Program** is an initiative of Agrivita Canada Inc. that aims to address the issues concerning the health and safety of people working and living in agricultural and rural areas to reduce the rates of fatality, injury and illness.

The foundation for applied research in the **AgriSafety Program** is a modified **Hierarchy of Control**. The **Hierarchy of Control** is a well-established theoretical construct that can be systematically applied to minimize exposure to workplace hazards. In other industries the **Hierarchy of Control** has been successfully applied and resulted in reduction and prevention of injury and death at work. Although the use of the **Hierarchy of Control** is not widespread in agriculture, there is evidence that it has the potential to achieve a three-fold reduction in farm injuries (Dosman et al. 2015).

The **AgriSafety Program** is funded by the **Industry-led Research & Innovation Stream** of the Agri-Innovation Program of Growing Forward II through Agriculture and Agri-Food Canada. The funding provided over four years (2014-2018) supports two key applied research projects:

1. **Low-Cost Roll-Over Protective Structures (ROPS)** Intervention Project which applies the engineering controls step in the Hierarchy of Control.

2. **Animal Housing Environments** (two components) – both components focus on occupational hygiene programs which fall into the category of procedural controls and elimination of hazard categories in the **Hierarchy of Control**.
   a. Air Quality in Canadian Pig Buildings: Reduction of Airborne Dust, Gas, and Human Pathogens in Buildings and their Environmental Dispersion
   b. Reducing Pathogen Distribution from Animal Transport

The projects of the AgriSafety Program are contributing to increasing safety of agricultural workers through practical applications. As the projects enter into the Program’s last year in 2017-2018, we anticipate this contribution to culminate in the production of the projects’ final output and a strong foundation for the next iteration of the AgriSafety Program.

**Knowledge Translation**

The Knowledge Translation (KT) team at the Canadian Centre for Health and Safety in Agriculture (CCHSA) works in partnership with the AgriSafety Program projects to develop KT materials to ensure that practical usable products, processes and knowledge are made available to users. The goal of KT is to get information from the applied research and development projects into the hands of producers and stakeholders, which is crucial for the integration of research to practice. In each year of the program the KT team puts together a number of bulletins for distribution through the Agricultural Health and Safety Network and other avenues. These bulletins can also be accessed online through the Agrivita website: http://agrivita.ca/program/knowledgetranslation.php

Currently, the KT team is collaborating with the research projects to produce a short video on the outcomes and importance of each applied research project. The videos will highlight the projects and the AgriSafety Program.

Low-Cost Roll-Over Protective Structure (ROPS) Intervention Project

About the Project
Increased tractor safety for a reduced cost is the aim of the ROPS project.

- Roll-over events are one of the leading causes of farm work-related deaths in Canada
- ROPS on tractors, in combination with seatbelts, have proven to be highly effective in the prevention of death or serious injury in a roll-over event
- Despite evidence of the efficacy of ROPS, many older tractors do not have ROPS
- Research has shown that cost is the primary reason farmers choose not to put ROPS on their older tractors

The Plan
To address this issue, PAMI has developed a project that designs and tests ROPS to retrofit older tractors for that can be built and installed by farmers themselves for an affordable price. PAMI has spent significant time and effort on creating a ROPS design that can easily be built by any farmer with basic welding skills. The design is such that the stress on the structure is not on the weld sites, but instead on the material.

How it Works
Participants in the pilot project receive blueprints from PAMI to guide them through the building and assembly process. The cost of materials is covered by the project in addition to a supplemental $250 for the farmers’ time. Once complete, farmers send their ROPS to PAMI for inspection and testing to evaluate structural integrity. After passing inspection and testing farmers will receive a certification sticker for their ROPS demonstrating that it meets Occupational Health and Safety standards.

Progress to Date
The project started off by carefully evaluating ROPS designs from the National Institute for Occupational Health and Safety (NIOSH), before PAMI developed their own design. Extensive legal and liability research was conducted in anticipation of the project becoming a nation-wide program. Drawings were then developed for the next stage of the project – testing the design. Interested producers are encouraged to contact PAMI to get involved in the project.

To date four farmers have participated in the ROPS pilot project, only taking an average of 6-8 hours to complete. It should be noted that the ROPS were comparable based on structural strength and standardized design to the PAMI prototype. The cost of the building materials for the ROPS averaged $144.

Looking Ahead
Coming into the last year of the project, PAMI is aiming to:

- Increase farmer participation to increase their sample size and receive more feedback on the design.
- Roll-out a nationwide program to make blueprints available to all Canadian farmers
- Investigate methods of monitoring and testing farmer-built ROPS through a certification process

Research Team

Lead:
Jim Wassermann, Prairie Agricultural Machinery Institute (PAMI), Humboldt, SK

Team Members:
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About the Project
Thousands of workers in the swine industry are exposed to important concentrations of airborne contaminants including human pathogens and metal and antibiotic resistant microorganisms. Exposure to the air in pig buildings can cause workers to develop infectious diseases and adverse respiratory problems. The main objective of this project is to offer the swine industry an efficient strategy to reduce airborne contaminants and protect the health of workers.

The Plan
The research being conducted by IRDA and CRIUCPQ seeks to fill these gaps in knowledge by examining the pathogens through nasal and throat swabs of swine workers and by evaluating and combining different technologies to reduce airborne contaminants.

How it Works
The project has four objectives:
1. Detect human pathogens and resistance genes by collecting air samples from pig buildings and nasal and throat swabs from swine workers
2. Optimize the design of three airborne contaminant reduction strategies:
   a. Oil sprinkling
   b. Solid-liquid manure separation
   c. Biotrickling air filtration
3. Evaluate the contaminant reduction strategies in a laboratory and commercial setting
4. Test the most effective combination of reduction strategies together in a commercial setting

Progress to Date
- Recruited swine workers and production facilities to participate in sampling
- Developed laboratory protocols to characterize pathogens and resistance genes for both metal and antibiotics
- Evaluated current contaminant reduction strategies and improvements made to ensure optimal performance
- Established laboratory-scale system to test each reduction strategy as well as combinations of the technologies using the Laboratoire se le bilan agroenvironnemental des bâtiments d’élevage (BABE)
- Collected and analyzed air samples and swabs of control groups and producers – results indicate the presence of several pathogens important to human and animal health

Research Team
Lead: Stéphane Lemay, Scientific Director, Institut de recherche et de développement en agroenvironnement (IRDA), Québec City, PQ
Team Members: Matthieu Girard and Stéphane Godbout, IRDA
Caroline Duchaine and Valérie Létourneau, Centre de recherche de l’Institut de cardiologie et de pneumologie de Québec (CRIUCPQ) at the University of Laval, Québec City, PQ

- Tested contaminant reduction strategies in a laboratory setting - results show a significant reduction in contaminants occurs when two or more strategies are combined

Recently the research team was faced with a unique obstacle – gaining access to swine production facilities. Strict biosecurity protocols currently in place at production facilities help to protect swine herds, but pose a challenge for onsite sampling. To put production facilities at ease, IRDA and CRIUCPQ developed their own biosecurity and decontamination protocols and had them certified.

Looking Ahead
In the final year of the project, efforts will be directed at completing laboratory analyses of air and nasal swabs collected. The team will also be determining the optimal combination of airborne contamination reduction techniques based on laboratory scale tests. Commercial scale testing will be carried out to determine the overall effectiveness and efficacy of the combined reduction strategies.
Reducing Pathogen Distribution from Animal Transport

About the Project
Transporting swine is a daily occurrence in Canada, and individual farms have developed biosecurity procedures to prevent infections being spread when introducing new animals to the herd. Despite these procedures there remains a risk of infection to breeding stock during transport, particularly through pig dense areas of Quebec, Ontario and Manitoba. Microorganisms including viruses can be aerosolized, become airborne and be transported well beyond their area of origin. This represent a major health and economic risk to producers as well as human and animal populations.

The Plan
The aim of the project is to develop an innovative design for an animal transport trailer that will help control airborne contaminants during transport and improve operational efficiencies.

How it Works
The project has been broken up into four phases:
1. Development of an innovative trailer design that controls airborne pathogens and improves operational efficiencies such as cleaning and disinfection
2. Assembly of the trailer prototype
3. Evaluate prototype's performance to control pathogen emissions
4. Conduct economic analysis

Progress to Date
- Developed an initial design for a prototype trailer in response to stakeholder concerns including risk of airborne disease infection, ease of loading and cleaning and variable thermal conditions
- Conducted in-depth computer simulations of conventional transport trailers and prototype design
- Established design for prototype of a completely enclosed trailer with air inlets at the front, air outlets at the back, and a front compartment contains an air filtration system with filters, fans and a power generator
- Began assembly of prototype trailer and components including air filtration system

The team has focused on assembling the major components of the trailer individually. These include the front trailer component that houses the ventilation fans, filtration system and power generator.

Future Work
The team will work toward completing the assembly of the prototype trailer and evaluating the prototype trailer's performance in both road and static tests. Following these evaluations the team plans to further optimize the prototype design based on the results and conduct an economic analysis on the feasibility of the trailer for commercial use.

Research Team
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