

## Alberta Innovates Bio Solutions' Impact Innovation 2014 Speaker Session

Alberta Innovates is given responsibility from the Government of Alberta to make investments in agriculture, food, forestry in the province of Alberta. These three industries make up \$27 billion worth of sales in Alberta each year. Alberta Innovates Bio Solutions (AI Bio) is focused on ensuring these sectors are profitable and sustainable through continued research and innovation.

Alberta Innovates hosted its fourth annual Impact Innovation Session in Edmonton on Wednesday, May 7, 2014, at the Citadel Theatre. Dr. Stan Blade, chief executive officer of AI Bio, gave a light-hearted and upbeat introduction to the event.

Emcee remarks were done by **Mr. Jay Ingram**, the well-known TV host from the *Daily Planet* on the Discovery Channel, and author of more than 12 books. He introduced the topics of the day by saying that Alberta is so much more than eight and a half months of winter each year, two hockey teams that never make the play-offs, and oil and gas, and that scientific advancements in agriculture and forestry are vital to the economy of the province and the country. He discussed how sustainability is the theme of the evening. Throughout the event, he elegantly and articulately introduced speakers by introducing a topic currently in the news and relating that topic to the work of the speaker.

**Dr. Raylene Reimer's** talk, "Adding Value to Food and Life", described her research on health and nutrition as it relates to obesity. She said that the longer an individual is obese, the more they've changed their biology. For example, an obese person has different types of bacteria in their gut.

- Appetite regulation is a complex and integrated system from the digestive system to the brain; this regulation is strongly influenced by our culture and post-dieting syndrome.
- Research has found adding prebiotic fiber to one's diet improves the types of bacteria in your gut, improves glucose intolerance and reduces hunger.

She recently did a study on obese individuals and how their bodies responded to healthy weight loss. They were assisted in losing 10 per cent of their body weight over a year. Then, in the following year, their feelings of hunger and fullness were assessed at regular intervals. Dr. Reimer's research showed that a full year after the weight loss, feelings of hunger were 20 per cent stronger and feelings of fullness were 20 per cent lower. Also, she found that the brain perceived desirable food as more desirable than before the weight loss. The body behaved as if it was starving even though the individuals were eating healthy food and exercising.

Recent clinical trial work was also done on the benefits of dietary fiber supplements, which were found to stop adult weight gain. The average Canadian adult gains half a kilogram each year, but those on the fiber supplement lost one kilogram over a year. Dr. Reimer summarized her talk by

explaining that dietary fiber has numerous health benefits, and there is value to be gained in adding high-quality foods to your diet—beyond simple weight loss.

**Dr. John Basarab** discussed the progress they are making towards sustainable beef production at Alberta Agriculture and Rural Development. He said that progress, for him, is about improvements in nutritional management, and breeding practices.

- By 2050, he expects there will be 9 billion people on the planet. This will drive a 55-per-cent increase in the global demand for meat.
- Sustainable meat production is a significant concern—especially for international restaurant food chains.

This concern about the ability to ensure sustainable meat production is about understanding environmental limitations (e.g., limitations of land and water) and rural development. This subject is about high-quality, affordable food for the masses, balanced against animal welfare and regulations in the agriculture industry.

To be sustainable, we need to strive towards advancements in science. Two strategies being implemented are swath grazing and animal breeding. Swath grazing is when the cows have to go out to pasture to get their food, instead of it being brought to them in the barn. This simple change means the farm can run more efficiently, since the farmers are freed up from bringing the food to the cows, and the manure does not need to be manually moved from the barn to the field. It also reduces fuel use and feed use.

He also discussed animal breeding with genomic selection as the newest option when wanting to control the size of the cows and the amount of food they need to consume to maintain an ideal weight. This research required the development of a large reference population of cattle. Fifty thousand pieces of information were recorded from each cow studied and then put into an equation to rate the value of the animals. Over 9,000 cattle were included in this study. From this wealth of information, scientists can now determine the estimated breeding values of cattle as it relates to feed efficiency. Now, the genome sequence of cows outside the study can be inferred based on the population sample of the cattle in the large reference population. Scientists can now assist farmers in choosing cattle that are likely to be efficient feeders. This means farmers can save about \$10 to \$15 in annual feed per animal. This also means each cow makes a smaller carbon footprint, since less feed is required to sustain them.

**Dr. Valerie Sim** discussed the harms of prion disease. In her lively way, she discussed a disease that remains an enigma in many ways. The scientific name for prion disease is transmissible spongiform encephalopathy (TSE). This misfolded protein attaches itself to other proteins, which also misfold, and the pattern continues. No one currently knows why the proteins misfold.

- TSE is always fatal in humans, and the average time between symptoms beginning and death is a mere four months.

- The disease is unique because of its three ways to get it: spontaneously (when a protein in your body has become misfolded, initiating the disease's start), from an infection (e.g., through a blood transfusion) or inherited.

When it infects the brain, it causes extensive nerve damage, and actual holes develop in the brain. To study this effect, scientists such as Dr. Sim infect a mouse brain with the disease, grow the back part of the brain in the lab, and study the progression of the disease.

Known as “mad cow disease” when it infects cows, and “chronic wasting disease” when it infects deer, elk and moose, it comes in many strains and also affects rodents. Since the disease can mutate and transfer to different species, there is a serious concern it could transfer to humans through various animals.

Dr. Sim is interested in studying how different kinds of prion disease affect different parts of the brain, studying therapies that prevent the prion disease from doing as much damage as it would otherwise, and trying to find ways to make therapy more effective.

**Dr. Scott Nielsen** discussed biodiversity conservation and the importance of protecting animals greatly affected by human-made changes to landscape and climate change. He explained the most significant landscape change to happen in Alberta is due to the oil and gas industry. Open surface pit mining gets a lot of media attention for its negative effects on the environment, but Nielsen argues that, from a terrestrial biodiversity standpoint, greater destruction happens from *in situ* mining.

- 142,000 square kilometers in Alberta has bitumen deposits. Only 3 per cent of these deposits is close enough to the surface to do open pit mining.
- *In situ* mining, which requires drilling wells, changes the landscape in ways that have significant effects on the animals living there.

*In situ* mining requires seismic lines to be laid down in a grid. Trees are cleared for this purpose, and often the wide open spaces are 100 meters apart. Wolves use these paths and cover distances with greater speed, which allows them to hunt more efficiently. As a result, he said, caribou populations have dropped significantly. Caribou are now listed as a species at risk, and the recovery strategy in place requires that 65 per cent of caribou habitat remain undisturbed.

His lab is doing work on restoration of land, to return it to an undisturbed state in a cost effective manner. A major part of this process is finding ways to encourage the establishment and growth of trees. When seismic lines are left alone, in most cases, trees do not grow. The cost of restoration efforts is about \$4000 per km, so he and his graduate student thought strategically about which areas should be focused on. They decided to leave alone areas that were highly likely to naturally recover, as well as areas with high levels of bitumen deposits. Instead, they focused on caribou zones.

Dr. Nielsen also shared the importance of biodiversity, explaining that it is more than just protecting mammals. Butterflies, lichens, and moss are also important when maintaining a healthy ecosystem. How do we find the places that best express biodiversity, to conserve the areas and maintain healthy and diverse ecosystems? Although protected areas exist, they were designed for recreation and tourism. His goal is to protect 10 per cent of all species in Alberta by identifying and pushing to protect hot spots of biodiversity in Alberta.

He also discussed climate change and its relationship to the movement of animals, based on the theory that all animals have specific ranges of temperature they must live within to be healthy. Animals at higher altitude—perhaps atop mountains—have most difficulties with climate change, since landscape fragmentation makes it challenging for animals to find a new location with the required climate niche.

When we think of vehicles and sustainability, we often think of gas mileage. But Magna International is an automotive parts manufacturer that is thinking far beyond that. **Mr. William Harney** is the executive director of Research and Development. His discussion focused on entrepreneurial goals and consumer-driven activities, as they relate to sustainability.

- Key mega trends in the car industry are globalization and demographic changes.
- Sustainability is typically looked at from an environmental and economic perspective.
- The number of miles per gallon is a focus for Americans, while the amount of CO<sub>2</sub> gas expelled per kilometer driven is a concern in Europe.

The main challenges facing this company include: the ability to recycle the products after they are no longer usable; affordability of the cars; CO<sub>2</sub> levels (how much CO<sub>2</sub> gas the vehicles put out into the environment), and gas consumption.

Magna International has chosen to focus on changing the materials used for weight reduction in vehicles. They have created a reinforced fiber that saves both cost and weight. This means the vehicles can be more affordable and use less gas. Mr. Harney said that building new materials includes considering the location of the factories because most large car companies want the materials to be produced locally throughout the world.

The newest trend in the automobile industry is fiber-reinforced products. Magna International has produced a 100-per-cent fiber-reinforced lift gate for a Nissan vehicle in 2013. Its glass-reinforced plastic was created for the first time in North America by Magna. Products such as this are valuable because the consumers value the lower cost and the vehicle's higher-fuel efficiency due to its lighter weight.

It was an engaging series of discussions, about pertinent topics for Alberta. For more information, please visit <http://bio.albertainnovates.ca/about/corpevents/impactinnovation2014/> or contact Marie Cusack, Communications Director, AI Bio, 780-638-4060, [marie.cusack@albertainnovates.ca](mailto:marie.cusack@albertainnovates.ca).