



Compte-rendu des journées scientifiques des viandes aux Etats-Unis

Compte-rendu de la réunion annuelle de l'association scientifique américaine de la viande : comment honorer le passé et inspirer le futur ? Un résumé des conférences plénières et des sessions techniques

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Selon les chercheurs américains, l'agriculture est très performante sur les plans nutritionnel, environnemental et technique. Le défi actuel est comment mieux communiquer ce message positif.

Résumé :

La 67^{ème} « Reciprocal Meat Conference » s'est tenue à Madison (Wisconsin, États-Unis) du 15 au 18 Juin 2014 (<http://www.meatscience.org/rmc/>). Plus de 800 participants ont suivi les séances plénières ou techniques traitant des sciences de la viande, de la transformation de la viande, de l'industrie de la viande et des attentes des consommateurs. Au cours d'un exposé principal, le Dr Lusk a suggéré que la culture populaire identifie de nombreux problèmes en agriculture et que la solution proposée par les citoyens est d'encourager la production locale, l'agriculture biologique, une production moins intensive, plus naturelle et avec le moins de transformations possibles. Beaucoup de ces idées sont relayées par des militants et de ce fait, une pression populaire peut s'exercer en faveur de changements injustifiés ou non pertinents. En revanche, le Dr Lusk a souligné que l'agriculture américaine a un message très positif à transmettre. Par conséquent, selon deux orateurs, le défi consiste à mieux communiquer efficacement ce message au public. En fait, il ne fait aucun doute que l'industrie alimentaire fournit des aliments avec une valeur nutritionnelle et une sécurité accrues, avec une plus grande variété, avec moins d'impacts sur l'environnement, et avec une plus grande praticité que par le passé. Un autre orateur a fait un exposé concernant le microbiote fécal et il a argumenté que le microbiote fécal est important pour la santé de l'animal, y compris le bovin et qu'il est fortement influencé par le régime alimentaire des animaux. Dans une autre conférence, le processus utilisé pour faire des recommandations scientifiques afin d'actualiser la prochaine édition des recommandations alimentaires pour les américains (DGA) a été expliqué. D'autres orateurs ont décrit les changements attendus dans cette prochaine édition. Ils ont fait valoir que les arguments soutenant un lien entre la consommation de viande et une moins bonne santé sont ténus. Ces orateurs prédisent que la nouvelle édition DGA mettra l'accent sur la réduction de la consommation de calories et de sel tout en prônant un apport protéique adapté à l'activité physique et à la croissance et que la DGA recommandera probablement une réduction de la consommation de viande ou de viandes transformées. La conférence du Dr R. Warner (Melbourne) a décrit les effets de la température *post-mortem* du muscle sur les propriétés de la viande. D'autres présentations techniques ont traité de la sécurité alimentaire, de la couleur de la viande, des charcuteries et de la biologie musculaire. D'autres sessions et posters ont traité d'un large éventail de sujets.

Abstract: Annual meeting of the American Meat Science Association. The Reciprocal Meat Conference – 2014. Honoring the Past – Inspiring the Future. An overview of formal presentations at general and technical sessions

The 67th Reciprocal Meat Conference convened in Madison, Wisconsin, USA on June 15-18, 2014 (<http://www.meatscience.org/rmc/>). Over 800 registrants participated in general and technical sessions dealing with meat science, meat processing, meat industry and consumer market issues. In a keynote presentation, Dr Lusk suggested that popular culture identifies many agricultural problems and that the popular culture solution is to move to local production, organic practices, slow, natural and unprocessed. Many of these ideas are supported by food activists. Therefore, there may be popular pressure for misguided changes. By contrast, Dr. Lusk emphasized that American agriculture has a very positive message. Consequently, the challenge is to effectively better communicate that message to the public. In fact, there is no doubt that the food system delivers more nutritious and safer food with wider variety, less environmental impacts, and greater convenience than at any time before. Another speaker made a talk concerning fecal microbiome and he argued that fecal microbiome is important to host health, including cattle and that it is highly influenced by animal diet. In another talk, the technical process used to make research based recommendations for the next edition of "Dietary Guidelines for Americans" (DGA) was explained. Other speakers described expected changes in the coming edition of DGA. They argued that published evidence linking meat consumption to negative health outcomes is limited in strength. They expect that new DGA will emphasize Calorie and Sodium reduction along with adequate protein intake with respect to physical activity and growth status and that DGA will probably recommend meat and processed meat intake be reduced or avoided. The Guest Lecture given by Dr. R. Warner (Melbourne) described muscle rigor temperature effects on meat properties. Technical presentations dealt with Food Safety, Meat Color, Processed Meats and Muscle Biology. Focused Sessions and posters broadened the program with a wide range of topics.

THE RECIPROCAL MEAT CONFERENCE

The American Meat Science Association (AMSA) celebrated its 50th anniversary at the 67th Reciprocal Meat Conference (RMC) in Madison, Wisconsin, USA on June 15-18, 2014. Over 800 registrants including nearly 400 graduate and undergraduate students and participants from the US and Canada and more than 10 other countries attended general, technical and reciprocation sessions along with poster displays.

Past presidents of AMSA were recognized and several recent presidents recapped the history of AMSA from its

founding at the 17th RMC, also held at the University of Wisconsin in 1964. Over the past 50 years AMSA has seen many changes. In the early years the organization was closely associated with the National Livestock and Meat Board. When the Meat Board was disbanded AMSA struggled to pick up a variety of functions previously provided by that organization. The considerable efforts of many AMSA leaders eventually led to notable growth and vitality in the organization.

I. GENERAL SESSIONS

The RMC included keynote presentations dealing with broad societal issues that affect the meat industry and meat scientists. Dr. Jayson Lusk opened the conference with his presentation, "The Food Police" and Mr. Jack Bobo addressed the group on the final day of the conference with his presentation, "Can Agriculture Save the Planet Before It Destroys It?"

The first address was by Dr. Jayson Lusk, Professor and the Willard Sparks Endowed Chair in the Agricultural Economics Department, Oklahoma State University and author of, "The Food Police: A Well-Fed Manifesto about the Politics of Your Plate". Dr. Lusk suggested that **popular culture identifies agricultural problems as: too much sugar, too much meat, too much processed food, too many pesticides, we're too fat, spending too much on health care, and agriculture is too corporate and unsustainable. The popular culture solution is to move to local production, organic practices, slow, natural and unprocessed.** Many of these ideas are supported by food activists using media and social media to bring social pressure for specific practices. Consumers with little connection to agriculture are easy targets for authors and activists who sensationalize the story with claims about health, environment, or animal welfare. **The result can be popular pressure for misguided changes** using taxes, subsidies, regulations or social pressure.

Dr. Lusk emphasized that **American agriculture has a very positive message.** Increased productivity means more food production per acre and more meat or milk per animal resulting in reduced inputs per unit of food production and reduced environmental impact. **The challenge is to**

effectively communicate that message to the public. The industry needs to offer an aspirational message: not just "9 billion mouths to feed". **"There is no doubt that the food system delivers more nutritious food with wider variety; improved safety, with less environmental impacts; and greater convenience than at any time in the Nation's history."**

Jack Bobo, JD, MS, Chief, Biotechnology and Textile Trade Policy Division, Senior Advisor for Biotechnology, US Department of State, anchored the final day of the conference. Mr. Bobo made the point that **hunger and malnutrition are at the core of most world-wide problems.** Illness and death due to starvation are well known. However, most of the unrest and social upheaval around the world can be traced, in part, to limited availability or high cost of food. Mr. Bobo suggested that we need to produce more food using less land and water in a world with competing views about food production. Societies in the developed world sometimes make poor decisions about agricultural production practices when perception of risk is equated with real risk. Mr. Bobo cited surveys showing that public perception of risk from GMO foods is greater than the risk from Flu. This is in spite of the fact that millions die from Flu each year.

Mr. Bobo had a message similar to that of Dr. Lusk, **"We need to improve our communication"**. "If you lead with the science you will lose your audience." Effective communication requires that you personalize your message, acknowledge your audience, and build a personal connection before talking about the science.

II. INTERNATIONAL LECTURE

Muscle temperature during rigor is long established as a factor affecting ultimate meat quality. As the 2014 International Lectureship Award winner Dr. Robyn Warner, Univ. of Melbourne, presented a lecture detailing her findings with respect to meat quality problems resulting from high muscle temperature during rigor mortis. Dr. Warner defined high rigor temperature as being greater than 35°C with muscle pH 6. High rigor temperature leads to

increased fluid purge, pale meat color, and limited tenderization during aging. Factors contributing to high rigor temperature are feeding practices with grain feeding contributing to high temperature, handling practices that increase animal stress and in-plant practices such as hide pulling, immobilization or electrical stimulation that trigger muscle contractions.

III. TECHNICAL SESSIONS

III.1. Food Safety

Food safety and pathogen control was the focus of several presentations at the RMC.

Dr. Terry Arthur, US MARC, described the observation of high event periods (HEP) for E. coli in beef trim. He

reported that an HEP often involves cattle from different feed yards and slaughter plants at the same time. However, there is typically one predominant strain of *E. coli* O157:H7 present in the diverse samples. Dr. Arthur discussed various contamination scenarios that might account for this observation.

Beef cattle are among the natural hosts for *E. coli* O157:H7. Dr. Vanessa Sperandio, Univ. of Tennessee, reported of efforts to understand quorum sensing (chemical communication among bacteria) by *E. coli* during their colonization of the beef colon. She concluded that SdiA, a quorum sensing transcription factor, is essential for *E. coli* colonization and survival in cattle. SdiA was found only in the colon, not in other parts of the gastrointestinal tract.

There is a growing realization that **fecal microbiome is important to host health**. Dr. James Wells, US MARC, explained that this is also true for cattle. He indicated that

III.2. Dietary Guidelines 2015

The US Departments of Health and Human Services and Agriculture cooperate in updating official nutrition guidance for Americans every five years. Dr. Betsy Booren, American Meat Institute, explained the technical process used by the Dietary Guidelines Advisory Committee to review scientific literature in order to make research based recommendations for the next edition of “Dietary Guidelines for Americans” (DGA), due for release next year. The DGA document is used by government agencies and public schools in designing their cafeteria meal plans and educational materials for the general public. With this in mind, Molly

III.3. Fresh Meat Color

Meat color is a fundamental determinant of consumer acceptability. In this technical session an overview of myoglobin chemistry was presented by Dr. Cameron Faustman, Univ. of Connecticut. Dr. Faustman described the protein and heme components of myoglobin. The chemical and physical basis of various meat colors was explained along with a brief discussion of the Zn porphyrin myoglobin reported in Parma Ham. Dr. Faustman challenged the group to develop a robust analytical technique for distinguishing between oxymyoglobin and carbonmonoxymyoglobin in modified atmosphere packaged fresh meat.

The heritability of beef color was discussed by Dr. David King, US MARC, in the context of mitochondrial function as a determinant of color stability. Most color variation is not accounted for by anatomical location in the body. Stability of red color during retail display is somewhat heritable. Certain breeds, Charolais and Limousin, exhibit high color stability while others, Angus, Hereford and Red Angus, have low color stability. Dr. King developed a

III.4. Processed Meats

The conference technical program included a selection of meat processing topics. Dr. Mac Orcutt, DuPont Nutrition and Health, discussed familiar and new ingredients that provide novel functions. Meat binders are often used to reduce formulation cost. However, other functional benefits may be more important. Binders may be used to thicken the raw batter thus enhancing manufacturing capabilities or to improve texture of the finished sausage. New manufacturing techniques such as co-extrusion or cook-in-bag processing often necessitate formulation changes.

the bovine fecal microbiota is complex and the composition of the microbiome can vary with diet. **Diet appears to have a greater effect on the fecal microbiome than animal-to-animal variation. Pathogen shedding and animal performance, growth or milk production, are greatly influenced by changes in the animal’s microbiome.**

Meat industry oversight with enforcement of food safety regulations in the US is primarily the responsibility of USDA, FSIS. USDA’s Chief Medical Officer, David Goldman, M.D., described the ongoing evolution of FSIS from a regulatory agency to a public health agency. FSIS’s focus is moving toward promotion and assurance of public health not just adherence to regulations. Dr. Goldman explained the agency’s pathogen, residue and allergen control activities. He updated conference participants on continuing changes in Salmonella monitoring and compliance activities.

Miller, M.S., R.D. Tyson Foods, and Dr. Thomas Boileau, Oscar Meyer, described expected changes in the coming edition of DGA and potential effects on the meat and poultry industry. **Published evidence linking meat consumption to negative health outcomes is limited in strength with most of the evidence being indirect and associative.** These experts expect that **new DGA will emphasize Calorie and Sodium reduction along with adequate protein intake with respect to physical activity and growth status.** It is expected that the **2015 DGA will recommend meat and processed meat intake be reduced or avoided.**

credible argument to show that mitochondrial enzymes may contribute to differences in fresh meat color stability.

Several techniques and interventions may be implemented to help stabilize fresh meat color. Dr. Brad Kim, Purdue University, described practical ways to improve fresh meat color. Accelerated chilling, especially for interior of large cuts, and maintenance of low temperature, -1.5°C, during storage can delay fading of red meat color. A combination of aging and freezing can be used to achieve tenderness while providing up to 7 days of display life. Modified atmosphere packaging with 80% oxygen and 20% carbon dioxide may extend shelf life but lead to reduced tenderness. For injection marinated fresh products ingredients such as alkaline phosphate and lactate may reduce oxidation. Lactate is especially effective for improving color stability. Dr. Kim explained the mechanism by which added lactate increases myoglobin reducing activity by increasing production of NADH.

The art of sausage manufacture is based on underlying science and engineering. Mr. Paul Morin, Kraft Foods – Oscar Mayer, explained the use of rheology, fluid flow and convective heat transfer concepts to optimize the key sausage manufacturing operations: Mixing, Stuffing, Chilling. In mixing, key factors include mixer design, size, vacuum level, shaft speed and mixing time. Stuffing is an exercise in fluid dynamics. Applying the principles of rheology and fluid flow to the design and operation of these systems helps reduce damage caused by shear while minimizing variability in flow rate. Temperature and heat

transfer rate during chilling must be optimized to ensure that the mechanical properties of the product are adequate for slicing and handling through packaging.

Approximately 35% of the fully cooked dinner / link sausages produced in the United States are processed using cook-in-package processing systems. Mr. Paul Hargarten, Salm Partners LLC., described the cook-in-package manufacture of sausage with emphasis on novel process controls needed for high quality product using a collagen co-extrusion system. Effective water binding and high viscosity

III.5. Muscle Biology

The protein titin is the largest and most complex protein in the body. Dr. Marion Greaser, Univ. of Madison, Professor Emeritus, provided a review and update on titin function in muscle. As a structural component titin is responsible for guiding sarcomere assembly, maintaining thick filament organization and resisting excessive elongation of the contractile apparatus. Titin interacts in a variety of ways with metabolic processes within the muscle cell. Dr. Greaser suggested that in postmortem muscle titin is a contributor to meat texture. Titin degradation during postmortem aging correlates with increased meat tenderness.

Transport stress leading to dead or downer pigs is an important animal welfare and economic issue for the US pork industry. Dr. Dan Nonneman, US MARC, discussed stress susceptibility not associated with the Halothane gene in pigs. The dystrophin-glycoprotein complex is a major part of the structure that attaches the contractile apparatus of muscle to the extracellular matrix at the costamere. A porcine stress syndrome was identified that is associated

IV. RECIPROCATION SESSIONS

Reciprocation sessions are convened with a small group of participants focused on a narrow topic with a short presentation followed by open discussion. More than 30 small group presentations and discussions were held for a wide range of topics including emerging and retrospective

V. POSTERS

Posters sessions were held with more than 130 posters presented by faculty, students, and industry representatives.

batter for successful co-extrusion is achieved by selection of meat and non-meat ingredients and maintenance of very low batter temperature (0-3°C) prior to stuffing. Cook-in-package processing requires batter that is free of entrapped gas so vacuum is applied during mixing and stuffing and carbon dioxide is generally not used for chilling. Co-extruded collagen is cross linked using a liquid smoke drench which may be formulated to impart little or no smoke flavor or aroma.

with a mutation leading to a reduction in dystrophin in the muscle. The mutation does not lead to typical muscular dystrophy.

Muscle cytoskeleton accounts for important meat properties such as tenderness, texture and water binding ability. Work by a number of researchers at Iowa State University has contributed much to our understanding of the molecular structures that compose muscle. Dr. Ted Huiatt, Iowa State University, reviewed current knowledge of muscle cytoskeleton with special focus on intermediate filaments and attachments with the myofilaments. Intermediate filaments, titin and nebulin, are most closely associated with the thick and thin filaments, respectively. Dr. Huiatt described in some detail the attachment of the Z-disk to or through the sarcolemma. Three structural mechanisms for that attachment were given: 1. Focal attachment of α -synemin with both vinculin and talin, 2. Dystrophin-associated protein complex, and 3. Spectrin-ankyrin attachments.

research, research priority planning, product safety, novel processing techniques, meat quality, animal welfare, environmental issues, career planning, grant writing and pedagogical issues among others.