Executive Summary

September 14 will mark the end of HICAHS’ five-year cycle of projects. As each project nears completion it is important that each project focuses on how to disseminate its findings to target audiences. The board advised HICAHS to develop apps and utilize online methods to reach people (see pages 5 and 8) and that it is important to incorporate an outreach and dissemination plan into each and every project while gathering continuous feedback from end-users.

HICAHS has submitted new projects for funding consideration to the National Institute for Occupational Safety and Health (NIOSH) in response to PAR 15-353. The HICAHS Advisory Board provided their input last year on these potential projects. The score results can be found on page 11, along with score results from an academic peer-review panel which HICAHS convened last year. Of the ten projects under consideration last year, only five of them were submitted to NIOSH for funding. HICAHS will learn in the next several months which projects, if any, will be funded for the next five years.

During planning for the NIOSH grant application, HICAHS Director Stephen Reynolds decided to disband the HICAHS Dairy Board and merge it with the HICAHS Advisory Board. The composition of the HICAHS Advisory Board changed this year with the addition of nine people who were formerly part of the HICAHS Dairy Board. The HICAHS Dairy Board had met twice, in 2011 and 2012, with some members invited to the 2013 International Dairy Research Consortium Meeting.

Vicky Buchan will be retiring this year after 25 years of service to HICAHS. Vicky and her husband Roy Buchan founded HICAHS in 1991 through a funding opportunity by the National Institute for Occupational Safety and Health. NIOSH was directed to establish a program of improving the health and safety of agricultural workers and their families in 1990 through Public Law 101-517. NIOSH has continued to maintain HICAHS and other “centers for agricultural occupational safety and health” through a series of competitive funding opportunity announcements, the latest of which was PAR 15-353. Steve Reynolds asked the board to join him in congratulating Dr. Buchan for her service.

Notes written by Allison De Vries Cassidy.
Attendance

A total of 34 people attended the meeting.

Board Members

**Attending:**
1. Ragan Adams, Colorado State University*
2. Shawn Archibeque, CSU Dept. Animal Sciences
3. Keith Belk, CSU Dept. Animal Sciences
4. Kevin Dole, Alpha Technology
5. Robert Ellis, Colorado State University
6. Alvaro Garcia, South Dakota State University Extension*
7. Herb Gibson, OSHA
8. Robert Hagevoort, New Mexico State University Extension*
9. Dan Hair, Workers Compensation Fund
10. Ed Hendrikson, SALUD Family Health Center
11. David Knell, Pinnacol Assurance
12. Matt Nonnenmann, Great Plains Center for Agricultural Health*
13. Olga Reuvekamp, Hilltop Dairy*
14. Brian Schiller, Flood and Peterson
15. Clyde Serna, Pinnacol Assurance
16. Wyatt Smith, DeLaval*
17. Clyde Serna, Pinnacol Assurance

**Regrets:**
1. Peter Kolb, University of Montana
2. Jessica Hawthorne Lemmel, Colorado Livestock Association
3. J.W. Schroeder, North Dakota State University*
4. Jon Slutsky, La Luna Dairy*
5. Mike Taylor, The Church of Jesus Christ of Latter-day Saints, Risk Management Division
6. Glen Whipple, University of Wyoming Extension
7. Allen Young, Utah State University Extension*

* Former HICAHS Dairy Board Members

**Guests**
1. Anita Peña, CSU Economist and HICAHS Pilot Program Recipient

**Staff & Students**

**Attending:**
1. Paul Ayers
2. Vicky Buchanan
3. Allison Cassidy
4. Maggie Clark
5. David Douphrate
6. Rebecca Foos, student
7. Paul Gunderson
8. Michael Pate
9. Louise Quijano
10. Steve Reynolds
11. Noa Roman-Muniz
12. Josh Schaeffer
13. Lorann Stallones
14. Jessy Tryon
15. Amanda VanDyke, student
16. Ethan Walker, student

**Regrets:**
1. Bill Brazile
2. Sheryl Magzamen
3. Craig McConnel
4. Lelia Murgia
5. John Rosecrance
Resigned/Removed:
The following Advisory Board members decided not to renew their HICAHS board membership, or were removed from the HICAHS Board due to lack of participation in board meetings or other factors.

1. Mitch Anderson, Agfinity, Inc.
2. Paige Backlund, Partnership of Academicians and Communities for Translation (PACT)
4. Richard Connell, Colorado Farm Bureau
5. Dan Fahrenholtz, North Colorado Family Medicine
6. John Hansen, Montana Logging Association
7. Julie Hulstein, Community Health Association Mountain/Plains States
8. Danell Kalcevic, Colorado Agri-women
9. Jeffrey Levin, Southwest Center for Ag Health, Injury Prevention, and Education
10. Mary Lynn, US Dept. of Labor – OSHA
11. Sherrie Nestor, Cargill, Inc. and Farm Safety 4 Just Kids
12. Bill Wailes, CSU Department of Animal Sciences

These individuals were part of the HICAHS Dairy Board, which was disbanded and merged with the HICAHS Advisory Board this year. They no longer belong to any HICAHS Advisory Boards.

1. Temple Grandin, Colorado State University
2. Nicolien Hamming, Hamming Dairy
3. Matt Keifer, Pacific Northwest Agricultural Safety and Health Center (PNASH)
4. Howard Manlove, Midwest Dairy Institute
5. Frank Mitloener, University of California, Davis
6. Risto Rautiainen, University of Nebraska Medical Center
7. Cecilia Rosas-Goulart, Pfizer
8. Leo Ruyne, Dairy Fountain, Inc.

In remembrance of Bill Wailes

HICAHS Board Member Bill Wailes passed away on February 26. Bill served as the Department Head of Animal Sciences at CSU for many years. He was a dairy farmer, mentor to many people, member of the HICAHS Advisory Board, HICAHS Dairy Board, and the International Dairy Research Consortium.
**AGENDA**

**HICAHS Advisory Board Meeting**  
*April 8, 2016*  
9 AM – 3 PM  
Colorado State University  
Lory Student Center, Longs Peak Room

<table>
<thead>
<tr>
<th>Time</th>
<th>Item</th>
<th>Discussion Leader</th>
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<tr>
<td>9:00 – 9:10</td>
<td>Welcome and Introductions</td>
<td>Stephen Reynolds</td>
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<tr>
<td>9:10 – 9:30</td>
<td>Update on the HICAHS Grant Renewal</td>
<td>Stephen Reynolds</td>
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<td>9:30 – 9:45</td>
<td>Outreach Program</td>
<td>Lorann Stallones</td>
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<td>9:45 – 10:00</td>
<td>Exposure Assessment and Intervention Analysis in Large-Herd Dairy Parlors</td>
<td>David Douphrate</td>
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<td>10:00 – 10:15</td>
<td>Exploring Shed Antimicrobial Exposures within High Plains Livestock Operations</td>
<td>Paul Gunderson</td>
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<td>10:15-10:45</td>
<td>Break</td>
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<tr>
<td>10:45 – 11:00</td>
<td>Design and Evaluation of Interventions to Improve Dairy Worker Respiratory Health</td>
<td>Stephen Reynolds</td>
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<tr>
<td>11:00 - 11:15</td>
<td>Enhancing Safety Training Effectiveness in Large-Herd Dairy Production</td>
<td>Noa Roman-Muniz</td>
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<tr>
<td>11:15 – 11:30</td>
<td>Development and Evaluation of a Computer-based ROPS Design Program</td>
<td>Paul Ayers</td>
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<tr>
<td>11:30 – 1:00</td>
<td>Lunch</td>
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<tr>
<td>1:00 – 1:15</td>
<td>Emerging Issues, Pilot, and Community Grants Programs</td>
<td>Stephen Reynolds</td>
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<tr>
<td>1:15 – 2:15</td>
<td>Closed Meeting for Board Discussion</td>
<td>Alvaro Garcia</td>
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<td>2:15-2:30</td>
<td>Break</td>
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<tr>
<td>2:30 – 3:00</td>
<td>Board Discussion of Regional Priorities</td>
<td>Alvaro Garcia</td>
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<tr>
<td>3:00</td>
<td>Closing</td>
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Discussion

**Update on the HICAHS Grant Renewal (Stephen Reynolds)**
Steve Reynolds described which HICAHS projects were selected for the HICAHS Grant Renewal, which was submitted in December 2015 – see page 11 for the presentation.

Juan Velez asked: Why there was such a great disparity between the advisory board scores and the academic (peer review) scores? Dave Douphrate explained that the proposals that were submitted were concept ideas; Allison Cassidy added that the peer reviewers had to review the proposals on a wide array of stringent criteria (demographics of populations served, sample size, feasibility of study, etc.) The advisory board and the peer reviewers were given different criteria by which to score proposals, which contributed to the discrepancy.

**Outreach Program (Lorann Stallones)**
Lorann Stallones summarized the outreach activities in which HICAHS engages – see page 13 for the presentation.

A board member asked how Lorann coordinated the publication of the Progressive Dairyman articles with Dave Douphrate. These articles are actually not coordinated by the outreach program, but Dave Douphrate can provide Lorann with information about the articles when she requests it. Outreach is conducted by staff throughout HICAHS; Lorann reports the staff’s outreach activities after they have been conducted.

Bob Ellis asked if there are data on who is accessing the newsletters. Are there data on impact and metrics? For example, can you show which counties these people are from? Lorann responded that she is limited on the data she can acquire, but she can report on how many “clicks” to the newsletter.

Kevin Dole advised that purchasing Google Ads can greatly increase the amount of subscribers.

**Exposure Assessment and Intervention Analysis in Large-Herd Dairy Parlors (David Douphrate)**
See page 14 for Dave Douphrate’s presentation. So far Dave has found no statistical significance in musculoskeletal symptoms between parlor designs.

Dave informed the board that OSHA will be implementing a local emphasis program targeting dairy farms in Idaho State following an increase in fatalities on dairy farms. According to an article by the Capital Press, “four of 10 OSHA-investigated workplace fatalities in Idaho have involved agriculture — an ATV roll-over, a feed wagon backed over a dairy worker on an ATV, an 18-year-old day laborer succumbed to heat exposure while weeding a wheat field and a worker drowned in a dairy lagoon.” There are already local emphasis programs in Wisconsin and New York.

Robert Hagevoort advocated for more stockmanship training. Most of these workers have absolutely no prior experience working with large animals, not even with a grandmother’s cow. These workers are coming from urban areas. As for which language to choose, for some workers it is better to speak English than Spanish, because the Hispanic workers speak a local language (e.g. Quechua) and do not speak Spanish at all. There is a fear when an agency like OSHA develops a local emphasis program.

Herb Gibson added that resources [such as Douphrate’s iPad video training] are valuable.

Kevin Dole added to the discussion on language barriers saying that some of the most articulate dairymen that he knows still have the highest employee turnover.

**Exploring Shed Antimicrobial Exposures within High Plains Livestock Operations (Paul Gunderson)**

Paul Gunderson gave a presentation on his project (page 17) and shared three handouts:

1. An FDA News Release: FDA regulation to help ensure judicious use of antibiotics in food producing animals (page 20),
2. A flyer titled, “Introduction to the HICAHS Agricultural Microbial Study” (page 22) and
3. A flyer titled “A Brief Rationale for the HICAHS Antimicrobial Project” (page 23)

He also mentioned that “Healthy Food Systems, Healthy People,” is a good resource developed by an association of public and land-grant universities.

Brian Schiller asked if composting eliminates the antimicrobial resistant bacteria because the heat destroys the antimicrobials. Dr. Gunderson replied that composting can reduce the number of antimicrobial bacteria, but does not eliminate them.

**Design and Evaluation of Interventions to Improve Dairy Worker Respiratory Health (Stephen Reynolds)**

Steve Reynolds presentation can be found on page 24.

Alvaro Garcia would be interested in a study showing the difference in human health with composted bedding versus sand. This fits with Dr. Reynolds area of research since he is studying aerosolized particles and their effect on respiratory health. Kevin Dole added that sand can be very different between operations and geographical locations. Get a single farm that has multiple different types of bedding and measure silica when discussing the sand bedding.

Robert Hagevoort asked about the second-to-last slide, regarding the difference between “tending sick” versus “medical care.” Steve will look into this.
Enhancing Safety Training Effectiveness in Large-Herd Dairy Production (Noa Roman-Muniz)
In addition to giving a presentation about her project (page 27), Noa Roman-Muniz showed a video that was produced through project funds: https://vimeo.com/161500888 (English version). The video has been produced in English and Spanish.

Kevin Dole commented that Spanish dialects can be very different. Noa and Juan, both native Spanish speakers, said that native Spanish speakers can usually figure out how to communicate, even with the unique dialect.

Sixty-one dairy workers were interviewed about their on-the-job injuries. They were asked about any injuries, not just injuries that resulted in lost time from work. It is assumed that there is much under-reporting of injuries among dairy workers.

Development and Evaluation of a Computer-based ROPS Design Program (Paul Ayers)
See page 31 for Paul Ayers’ presentation.

- Tractor rollovers remain the leading cause of death in agriculture
- Ayers has developed a computer-based ROPS design program to meet regulations. You just enter in all dimensions and get output of ROPS plan
  - Use bolted method of attachment
  - Use in Excel due to the software limitations and capabilities of the manufacturers
  - Also provides all of the materials needed to make ROPS and the price to purchase the materials
- Adding more tractors to the design program
- He is working with ROPS manufacturers in US, Australia, and Canada
- Requested finite element test—pre-test before the real ROPS test
- Experimental and finite test fit each other fairly closely
- John Deere, AgCo, CNH, and Kubota have helped develop and release promotional material to support ROPS rebate program
- Foldable ROPS
  - Folding down ROPS in the inoperable position
  - Next project is to design a program for creating foldable ROPS
  - Use promotional material “Keep Your Guard Up” for the foldable ROPS

Emerging Issues, Pilot, and Community Grants Program (Stephen Reynolds)
Steve Reynolds presentation can be found on page 38. Attendees were advised to learn more about the Community Grants Program by reviewing the handout from John Rosecrance, who was not present at today’s meeting (page 40). Dr. Rosecrance’s student Rebecca Foos provided some information on the Community Grants Program in his absence.
The Community Grants Program focuses on projects that have an immediate, practical impact. Emerging Issues funds have been used to address emerging needs, such as the bird flu outbreak that occurred this year. HICAHS solicited ideas from the board a couple months ago on how to spend the remaining funds; these ideas are outlined in the presentation. The ones that Steve Reynolds is considering for funding are Robert Hagevoort’s idea to create stockmanship videos and Scott Cotton’s idea to do trainings on extricating livestock from a transportation wreck/rollover.

Additionally, Steve Reynolds is planning on funding HICAHS Researcher Joshua Schaeffer for ~$20K to do additional analysis of antibiotic resistant bacteria found in air, water and manure samples from a Colorado dairy. The geographical location of the antibiotic resistant samples will be mapped across the dairy. The hypothesis is that antibiotics and antibiotic resistant genes will vary in relationship to sample location and proximity to point source (e.g., fresh cow pen vs. calving area). Mapping the diversity of antibiotics and resistant genes across a dairy will allow greater insight into the emergence, dissemination, and risk of antibiotic-resistant bacteria in the context of bioaerosols and worker health.

Rebecca Foos, graduate student, reported that two chainsaw safety videos were created in conjunction with Montana loggers. The videos can be viewed here on the U.S. Agricultural Safety and Health Centers YouTube channel. Elise Lagerstrom, Ph.D. student, is also working on developing an emergency response system.

In the dairy industry, funds from the Community Grants Program are being used to develop training and a survey. Dr. Rosecrance and other researchers are developing a series of health and safety articles on the dairy industry which will be published in the online, open-access journal Frontiers in Public Health. This series is similar to the 2013 Journal of Agromedicine Special Issue (Vol. 18, Issue 3): A Global Perspective on Modern Dairy: Occupational Health and Safety Challenges and Opportunities, authored by the members of the International Dairy Research Consortium.

Closed Meeting for Board Discussion (chaired by Alvaro Garcia)
The board met privately to discuss HICAHS research and activities.

Board Discussion of Regional Priorities (Alvaro Garcia and all board members)
HICAHS heard from the advisory board about their opinion on regional priorities. In every project, you need to incorporate how you disseminate the information. There needs to be a method for feedback from the public for all projects. Smart phone apps are very popular right now and could be a way to share HICAHS research information. There are many other routes to disseminate information, such as Facebook, Twitter, and YouTube. Facebook is for older generations whereas Instagram, Twitter, Snapchat reach younger people. When you use social media you can acquire built-in metrics that somewhat show impact, or at least a proxy for impact.

HICAHS could engage producers by making a video game about health and safety. If you make the wrong decision and you end up dead.
Another idea is to create a question of the day for dairy workers. Get immediate feedback in their language. A quick sound bite of safety. To get signed off on the time clock, they have to answer the question of the day.

You can talk to 450 dairymen per day, but are they applying what we have taught them? What are the intermediate and long-term results of these approaches?

Dave Douphrate: In sum, we are talking about strategic human resources management.

Robert Hagevoort: HICAHS should develop tools for performance evaluation to measure safety performance. Paper is out, make the tools audio/visual.

An issue with online and electronic programs is figuring out where the data be stored for all these dairies, and making the software compatible with android and iPhone phones (if on phone). How to manage the subscription issues and learning management software.

Immigration reform remains an important issue in agriculture.
APPENDICES

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7. A Brief Rationale for the HICAHS Antimicrobial Project Flyer .................................................................................. 23
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9. Enhancing Safety Training Effectiveness in Large-Herd Dairy Production Presentation by Noa Roman-Muniz .................. 27
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12. Translation and Dissemination in Agricultural / Forestry Health and Safety Handout by John Rosecrance and David Gilkey .... 40
Update on the HICAHS Grant Renewal

HICAHS Advisory Board Meeting
April 8, 2016

Colorado State University

Proposal Development Timeline

2014 Regional Needs Assessment
2014 SWOT Needs Assessment
2011 – 2015 Input from Advisory Boards
Dec. 5, 2014 HICAHS Requests Pre-Proposals
Feb. 9, 2015 Pre-Proposals Due
Feb. 26-27 Peer Review and Advisory Board Review
March 11 Proposals selected by Dr. Reynolds and researchers notified
Dec. 17 Grant Submitted

HICAHS Pre-Proposals

Selected for Grant Application
1. Stephen Reynolds, Sheryl Magzamen, Joshua Schaeffer: Antimicrobial Resistant Bacteria: Exposures and Health of Dairy and Beef Workers
2. Paul Ayers: Development of Engineering Controls to Reduce Foldable ROPS Overturn Fatalities
4. Michael Pate: Agricultural Safety Education Initiative
5. John Rosecrance: Translation and Dissemination through Agricultural Partnership and Community-Based Participatory Research (This project was integrated with Outreach Program)

Not Selected
2. David Gilkey: Training Evaluation for ATV Safety Institute’s Hands-On Rider Course
3. Angelo Izzo, Karen Dobos, Richard Bowen: Incidence of exposure to Coxiella burnetii in at risk populations and development of a new vaccine
5. Bledar Bisha: Assessing the Role of Antimicrobials and Sanitizers in the Physiology and Evolution of Antimicrobial Resistant Escherichia coli and Enterococcus sp. in Simulated Beef Production Environments

Advisory Board and Peer Review Scores of Proposals

[Graph showing scores for selected projects]

Analysis and Graph created by Allison Cassidy
New Vision & Mission

Current

• VISION: A Healthy and Productive Workforce for U.S. Agriculture and Forestry.
• MISSION: To lead and coordinate regional and national efforts to improve the well-being and productivity of U.S. Agriculture and Forestry workers through increased health and safety awareness and evidence-based practices.

Future (Sept. 2016+)

• VISION: To be the preeminent scientific authority, resource, and site for innovative strategies that improve the health and safety of agricultural and forestry workers and their families in the high plains intermountain region and beyond.
• MISSION: To be a dynamic catalyst for transdisciplinary research, training, and outreach that reduces the burden of human morbidity and mortality in agriculture and forestry in the high plains intermountain region and beyond. Our projects are driven by ongoing stakeholder feedback identifying priority health and safety needs of regional agriculture and forestry.

New Administrative Specific Aims

Current

Aim 1. To provide leadership and management;
Aim 2. To ensure interdisciplinary coordination and synergy through the structure and functions of the advisory boards (Internal Advisory Board; External Advisory Board; and Dairy Advisory Board) and continued engagement of HICAHS researchers and staff;
Aim 3. To coordinate an active outreach program;
Aim 4. To provide funding for Pilot/Feasibility Projects on topics of regional priority and on emerging issues in Public Health Service Region VIII;
Aim 5. To conduct continuous evaluation and feedback based on the Systems Theoretical Model and a RE-AIM Framework.

Future (Sept. 2016+)

Aim 1. Provide vision, leadership, strategic planning, and management;
Aim 2. Ensure transdisciplinary coordination and synergy through the structure and functions of the Internal Advisory Board and External Advisory Board, and through continued engagement of HICAHS researchers and staff;
Aim 3. Coordinate and facilitate innovative, high impact-programs in Outreach and Research;
Aim 4. Continue to foster and enhance the HICAHS Dairy Health and Safety Network and the HICAHS International Dairy Consortium.

Next Steps

May 9-13, 2016
NIOSH “Special Emphasis Panel” will review Grant Application

July-August, 2016
Centers notified of funding status

Sept. 15, 2016
Beginning of new 5-year cycle
Outreach Core

HICAHS Advisory Board Meeting
April 8, 2016

Colorado State University

Outreach Core

The outreach program is designed to extend knowledge-based information in regard to evidence based prevention and control programs in order to increase the skills and improve the practices of workers in agriculture and forestry to reduce injuries and improve health and well-being.

The model HICAHS uses adheres to the Extension philosophy of engagement and becoming more productively involved in communities with a mission of improving health and well-being.

Accomplishments of the Outreach Core

- Regional Resources in Agriculture, Forestry and Fishing Health and Safety Directory developed for the HICAHS region (2013).
- A detailed Communication Plan was developed (2012) and is being implemented.
- YouTube channel for the U.S. Agricultural Health and Safety Centers (2013-present)
- E-Newsletters (2014-present)
  - Antimicrobial resistance
  - All Terrain Vehicle Safety
  - HICAHS work on Roll Over Protection Structures
  - Safe pesticide practices for winter months
  - HICAHS Research Stretches Internationally: The Italian Connection

Impact Outreach Core

- Progressive Dairyman monthly circulation of over 30,000.
- YouTube channel for the U.S. Agricultural Health and Safety Centers received more than 1100 views in the first six months on-line.
- Distribution list for HICAHS email newsletter includes over 200 recipients.
- Farm and Ranch eXtension Safety and Health (FReSH) Community of Practice.
  - Website takes ‘FReSH’ look at agricultural safety and health
  - Safety Training for Youth working in Agriculture: tractor and farm machinery certification offered
  - SAY What? A New Source of Agriculture Safety Information for Youth
  - Farm and Ranch eXtension Safety and Health (FReSH) Community of Practice website had a steady increase of visitors from just over 4,000 in the first year to over 7,000 visits by the end of the second year with an overall number of over 15,000 visits.
Exposure Assessment & Intervention Analysis in Large-Herd Dairy Parlors

Milking Parlor: Triad of Interactions

One Health: Triad of Interactions

Background

- Milking parlor realities
  - Industry trend to large-herd operations
  - Vulnerable working population
    - 79% of US milk supply from farms with immigrant labor
  - Adverse health outcomes
    - 77% report musculoskeletal symptoms
    - 55% report symptoms in upper extremity (Douphrate 2014, 2016)
    - 50% of workers’ comp claims inside milking parlor (Douphrate 2006, 2009)
**Study Objectives**

- Full-shift and task specific physical exposures across parlor configurations
- Pit height
- Milking tool: teat scrubber
- Milking unit design
- Recommendations and strategies for producers

**Task Specific Controls**

- Milking cluster design  
  *manuscript submitted*
- Milking tool: Teat scrubber  
  *manuscript submitted*

**Full-shift Exposures**

(8 - 12 hour shift durations)

- Muscle forces*
- Posture & motion*
- Parlor design
- Work organization
  - Milking routine
  - Work-rest strategies
  - Staffing level
- Worker performance*

*manuscript in development

**Milking Task Muscle Activity**
Communications
- *Progressive Dairyman* (21 articles to date)
- Extension newsletters
Safety Training
- Owner and manager
  - US Dairy Extension & Training Consortium
  - OSHA training (NM, KS, CO, MN, IA, ND, SD, NE)
Worker
- OSHA Susan Harwood Training
  - 755 workers in 14 months (goal: 900+ in 24)
  - TX, NM, KS, CO, SD, NY

**Past Efforts:**
- push information to stakeholders

**Present Reality:**
- information is pulled by stakeholders
  - producers, associations, regulatory bodies
- assistance, expertise and information related to:
  - worker performance
  - intervention strategies
  - effective training tools
  - safety management & leadership
- recent examples: Washington and Idaho
Exploring Shed Antimicrobial Exposures within High Plains Livestock Enterprises

Advisory Board Meeting
April 8, 2016

BACKGROUND

• 30% - 80% of antimicrobial dosage by be excreted as waste
• Recipient health status and feeding protocol affect shed rate
• Persistence within the enterprise is affected by type of storage structure, concentration, temperature, and type of field application technology in use
• Human exposure results from critter handling, fecal/urine aerosolization, and manipulation/repair of pumping & application technology
• Fecal material/urine that has been amended with antimicrobials may alter the natural microbial flora of high plains soil biomes
• Such alteration may give rise to development of structural products or mutant microbials

Study Aims of This R20 Initiative (using a “biome” approach)

• Quantify shed antimicrobial concentrations, their metabolites, and other structural related transformation products in fecal materials
• Characterize dissipation half-lives of these compounds
• Determine presence of resistance determinants

• Compare microbiomes of fresh animal feces/urine vs. stored slurry, slurry-amended field soil and airborne field dust
• Explore short-term spatial movement across field soil zones
• Identify actionable steps to reduce/eliminate worker exposure
Study Progress

• Along came Porcine Epidemic Diarrhea – PEDv in early 2013 and it persisted into 2015
• Then came H1N1 in 2014 and it persists to this day
• So, back to the drawing board relative to all onsite enterprise operations
• Farm visits commenced in the summer of 2015
• Laboratory analysis begun in the fall of 2015

Field/Facility-level Study Procedures

• Objective: Minimize organic material transfer
• Procedures:
  1. Pristine cleanliness
  2. Mapping farm sites, fields, and roads/lanes
  3. Layout of all vehicular/people movement
  4. Enterprise employees extract tail head and manure storage structure fecal samples

Study Outcomes…

• Detected presence of “niche biomes” within manure storage structures and field soil
• Tetracycline resistance genes detected in field soil (no “resistomes” detected to date)

Note Contrast to Other Studies…

• Dr. Ruth Bell – CDC – “antibiotic resistance comes through foodborne infections that are antibiotic resistant” – 03/16/2016
• Microbial Ecology Group @ CSU – “We need to expand our thinking…and develop new and improved methods to better understand how antibiotic use drives a complex network of genetic modifications within (environmental) microbial communities.”
Implications:

- Veterinary Feed Directives will change microbial communities
- Vaccines shall remerge in importance
- Biosecurity procedures need to be instituted @ farm/ranch levels
- Animal flows...
- Environmental management
- Livestock culling
- Diagnostic testing first before treatment
- Composting of manure
- Heat treatment

Topics for Future Study:

- What is the role of livestock diet in development of resistance genes?
- Can other farm/ranch level gene depressive strategies or technologies be identified that are efficacious?
- What “driver(s)” exist that result in emergence of resistance genes?
- Can such “driver(s)” be modified at the farm/ranch level?
- If so, how?
- What is the role for PPE use among agricultural workers?
- Can these several farm/ranch biomes (cattle/poultry gut, stored feces, field soil, field dust, and groundwater) be characterized?

Questions or Observations?
FDA News Release

FDA regulation to help ensure judicious use of antibiotics in food-producing animals

Veterinary Feed Directive (VFD) final rule issued today

For Immediate Release

June 2, 2015

Release

The U.S. Food and Drug Administration announced today the Veterinary Feed Directive (VFD) final rule, an important piece of the agency’s overall strategy to promote the judicious use of antimicrobials in food-producing animals. This strategy will bring the use of these drugs under veterinary supervision so that they are used only when necessary for assuring animal health. The VFD final rule outlines the process for authorizing use of VFD drugs (animal drugs intended for use in or on animal feed that require the supervision of a licensed veterinarian) and provides veterinarians in all states with a framework for authorizing the use of medically important antimicrobials in feed when needed for specific animal health purposes.

The VFD final rule continues to require veterinarians to issue all VFDs within the context of a veterinarian-client-patient relationship (VCPR) and specifies the key elements that define a VCPR. These key elements include that the veterinarian engage with the client (i.e., animal producer or caretaker) to assume responsibility for making clinical judgments about patient (i.e., animal) health, have sufficient knowledge of the animal by conducting examinations and/or visits to the facility where the animal is managed, and provide for any necessary follow-up evaluation or care. The final rule will require veterinarians to follow state-defined VCPR requirements; in states where the FDA determines that no applicable or appropriate state VCPR requirements exist, veterinarians will need to issue VFDs in compliance with federally defined VCPR requirements. All veterinarians will need to adhere to a VCPR that includes the key elements in the final rule.

“The actions the FDA has taken to date represent important steps toward a fundamental change in how antimicrobials can be legally used in food-producing animals,” said Michael R. Taylor, FDA deputy commissioner for foods. “The VFD final rule takes another important step by facilitating veterinary oversight in a way that allows for the flexibility needed to accommodate the diversity of circumstances that veterinarians encounter, while ensuring such oversight is conducted in accordance with nationally consistent principles.”

In December 2013, the agency published a guidance document, which calls on animal drug manufacturers of approved medically important antimicrobials that are put into water or feed of food-producing animals to voluntarily stop labeling them as drugs that can be used to promote animal growth and change the labeling of their products for the remaining

http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm448446.htm
uses to require veterinary oversight of these drugs when they are used for therapeutic purposes. All of the affected makers of these drugs have committed in writing to participate in the strategy.

The FDA, an agency within the U.S. Department of Health and Human Services, protects the public health by assuring the safety, effectiveness, security of human and veterinary drugs, vaccines and other biological products for human use, and medical devices. The agency is also responsible for the safety and security of our nation’s food supply, cosmetics, dietary supplements, products that give off electronic radiation, and for regulating tobacco products.

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**Inquiries**

**Media**

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- 240-402-0537

**Consumers**

- 888-INFO-FDA

**Related Information**

- [Final Rule: Veterinary Feed Directive](https://www.federalregister.gov/articles/2015/06/03/2015-13393/veterinary-feed-directive)
- [FACT SHEET: Veterinary Feed Directive Final Rule and Next Steps](http://www.fda.gov/AnimalVeterinary/DevelopmentApprovalProcess/ucm449019.htm)
- [Placing Animal Drugs under Veterinarian Oversight: Questions and Answers with Michael Taylor and William Flynn](http://www.fda.gov/AnimalVeterinary/DevelopmentApprovalProcess/ucm448871.htm)
- [Draft Guidance for Industry #120 Veterinary Feed Directive Regulation Questions and Answers](http://www.fda.gov/downloads/AnimalVeterinary/GuidanceComplianceEnforcement/GuidanceforIndustry/UCM052660.pdf)
Introduction to the Agricultural Microbial Study

Humans and animals harbor trillions of bacteria in and on their body (gut, mouth, skin, hair, etc.). These bacteria are of different types and possess different roles. Most of these bacteria are beneficial to their host’s health because they help in digesting food, extracting nutrients, and creating energy.

For example, different groups of bacteria harmonize their activity in the gut so that nutrients can create energy and promote sustainable life - but if that harmony is disrupted, or in other words, one group increases in number over the other, then disharmony could result in poor health of animals or humans. And, studies have shown that gut bacteria in humans not only affects overall health but also influences brain function. If we know the right combinations of bacteria in the gut, then a day may come when we can supplement the gut of human or animal hosts with bacteria that enhance health and productivity.

Soil also contains thousands of bacterial species and most of them are believed to be very beneficial to crop and pasture growth and development as well as the larger non-agricultural environment. In fact, there are more bacteria in one teaspoon of healthy soil than there are people on planet Earth. So, there is much to be learned yet about the number and types of bacteria in agricultural soil and their precise roles, including the impact of use of livestock manure as a key source of fertilizer. Knowing more about these roles could lead to agricultural practices that enhance crop health and productivity and the health of agricultural workers who till soil.

Across the world, the greatest source of nutrient for soil is animal manure. Rich in nitrogen, phosphorus and potassium, as well as micronutrients, manure mirrors the gut biome and is often readily available to provide the nutritional anchor for growing crops and rangeland pasture. Manure may also contain veterinary pharmaceuticals or substances that may amend bacteria within soil. We are interested in these matters, so have designed a study that explores the bacterial content of fresh livestock and poultry manure, as well as manure stored within on-farm storage structures, and soil that has received manure across time.

We are contacting you because we believe you can help develop this knowledge for agricultural producers. We would like to collect some fresh manure from your livestock or poultry as a surrogate for gut bacteria, manure from your storage structures, and field soil to see what kind of bacteria populations and other related products are resident in each media. We have developed very non-interruptive procedures to guide our work while at your livestock facility and assure you of our undivided attention to your needs. One of us will call you to make an appointment with you, address any questions you may have, and identify a convenient time to collect samples.

You may wish to contact Dr. Paul Gunderson @ 701-662-1652 (Paul.D.Gunderson.1@lrsc.edu), or Dr. Sanjay Shukla @ 715-389-5363 (Shukla.sanjay@mcrf.mfldclin.edu), or Dr. Steve Reynolds @ 970-491-3141 (Stephen.Reynolds@Colostate.edu).
A Brief Rationale – The HICAHS Antimicrobial Project

Livestock and poultry operations can be challenging. Equipment breakdowns, ill livestock or poultry, employee recruitment and retention, and fluctuating financial margins can create formidable issues for producers. And, these operations may face drug challenges as well. Not the type involving human use of controlled substances, rather livestock or poultry use. With the Food & Drug Administration mandating resort to Veterinary Feed Directives by the end of this year, one agricultural practice that uses antibiotics for growth promotion in food livestock and poultry will soon end. But does the challenge end with this practice?

Likely not. Veterinary drug use raises three concerns among producers: economics, drug residues, and antibiotic resistance.

Economics. Drugs are expensive. However, many livestock and poultry enterprises make little use of a consulting veterinarian role. One of the best uses of a consulting veterinarian is to increase a producer’s return on Investment (ROI). The cost of miss-diagnosis, treating the wrong target, or using the wrong treatment adds up quickly...see below. Veterinarians can prevent this from happening in the first place.

Drug Residues. Many livestock and poultry producers in the U.S. have worked tirelessly to eliminate residual drug levels. Doing so improves the ROI since withholding times to market are reduced. However, when a producer uses a drug in a manner not labelled, or administered differently from label in terms of dose, frequency, or site, residues are certain to occur, causing increases (often substantial) in withholding time. Routine use of a consulting herd or avian “veterinarian of record” can reduce this problem since the veterinarian is responsible for developing treatment protocols, specifying withholding time intervals, and evaluating treatment outcomes and records.

Antibiotic Resistance. When an antibiotic is administered to livestock or poultry, it not only targets the specific bacteria causing illness, deformity, or death, it also typically involves other bacteria resident within the host’s body. Such bacteria may demonstrate selection pressure in which sensitive bacteria die, while other bacteria survive. This process may lead to multiplication of surviving bacteria, which in turn present resistance to the antibiotic in use. Over time, agricultural workers will carry such bacteria on their skin, clothing, boots, and gloves, distributing the bacteria elsewhere within agricultural premises, and if presenting for clinical care in rural clinical settings, those environments as well. Introduction of resistant pathogens may evolve into a serious persistent issue within both agricultural and clinical venues.
Specific Aims

- **Aim 1**: Determine respiratory response to three bioaerosols constituents based on task among dairy workers (endotoxin, beta glucan, peptidoglycan).
- **Aim 2**: Design and assess interventions that address bioaerosol exposures associated with respiratory health in dairy settings.
- **Aim 3**: Evaluate the feasibility and acceptability of intervention strategies to dairy industry partners and employees.

Personnel Recruitment

- **Goal**:
  - Workers across multiple (7) tasks at each dairy (4)
  - Three consecutive work days plus a day off

Sampling Strategy

- **Personal Samples**
  - Pulmonary Function Test (Pre- & Post-Shift)
  - Nasal Lavage (Post-Shift)
- **Air Samples** (Full-Shift)
  - Gravimetric
  - β-Glucans
  - Endotoxins
  - Peptidoglycans
- **TNF-α**, **IL-6**, **IL-1b**, **IL-10**, **IFN-γ**
Sample Size

- Total Number of Personal Samples Collected
- Includes repeated individuals
- Individual Workers
- Completed at least one day-off sample or work day sample
- Individual workers that completed both day-off and three work full-shift work days

Dust Concentration by Task

Endotoxin Concentration by Task

Cytokines from Nasal Lavage Samples
Cellular Differentiation from Nasal Lavage Samples

Task-Based Cross-Shift Change in Pulmonary Function (FEV1)

Current Ideas for Interventions

- Feed additives
- Best practices with manure land application
  - pivot irrigation/irrigation system (alert systems)
- Biodigestion
- Frequency of parlor flushing
- Bedding — with an emphasis on sand
- Ventilation

QUESTIONS AND DISCUSSION ABOUT POTENTIAL INTERVENTIONS
Enhancing Safety Training Effectiveness in Large Herd Dairy Production

Noa Román-Muñiz, DVM, MS
Department of Animal Sciences
Colorado State University

Current training interventions... are we doing enough???

Multidisciplinary Approach

Psychology- Lauren Menger, MS, and Megan Dietz
Psychology and Public Health- Lorann Stallones, PhD
Anthropology- Teresa Tellechea, PhD, and Florencia Pezutti, MS
Environmental and Radiological Health Sciences- John Rosecrance, PhD, CPE
Animal Sciences and Veterinary Medicine- Flor Amaya Soto, MV

Aims

To Identify challenges and opportunities in current training strategies.

To develop, implement, and evaluate safety workshops that enhance the effectiveness of safety training for dairy workers and managers.

✔ Focus groups
✔ Guided interviews
✔ Training module
Focus Groups

14 focus groups
46 workers and 22 managers
CO and SD

Focus Groups Highlights

• Workers:
  - Diverse dairy experience
  - Knowledge gap - animal behavior, physiology, diseases
  - Work pressures
  - Inconsistent training
  - PPE
  - Animal handling hazards non preventable
  - Discrimination, communication
  - Middle managers are key

Guided Interviews - Dairy Workers

Individual interviews
8 CO dairies
61 Workers
74 questions
  - Structured and open-ended
  - Validate and assess the prevalence of themes identified during the focus groups

Analysis in progress: assess if factors are significantly associated with outcomes of interest

Preliminary Results - 61 interviews

• Demographics
  - 79% male
  - 98% Spanish (native language)
  - 34.4 yrs age
  - 5.7 yrs dairy tenure
  - 72% received safety training (varied greatly)
  - 39.3% at least 1 injury
  - 10.5% at least 1 illness
Preliminary Results- 61 interviews

54.1% of participants believe that dairy work represents an injury risk.

32.7% of dairy workers believe that dairy work could be a risk to their health (illness).

The mean for job stress among participants was 3.2 (1-5 scale).

Risk Perceptions

- Risk of Injury by task (1=low, 10=high)
  - Calving 7.40
  - Hospital 7.07

- Lowest
  - Moving cows 5.09
  - Milking 6.19

- Risk of Illness by Task (1=low, 10=high)
  - Hospital 8.04
  - Calving 7.31
  - Manure 7.26

- Lowest
  - Equipment 4.26
  - Milking 4.94

Injury prevention strategies...

- “To pay more attention.”
- “Ask for co-worker’s help.”
- “To have another person helping.”
- “It was unpredictable.”
- “...the thing one does not know is how is that animal going to react...there was no way to prevent it...cows are unpredictable.”

Zoonotic disease exposure potential

- 77.2% believe that they can acquire a disease from farm animals.
- Only 50.9% told physician about their work.
**Zoonotic Disease Training Program**

- By the workers for the workers
- Personal & informal
- Best practices
- Assess effectiveness

**Take home messages:**
- Zoonoses can be easily prevented
- When we protect ourselves, we also protect our families

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**Title: Best practices for staying healthy on the dairy farm**

- Assess efficacy in terms of
  - Knowledge
  - Attitude
  - Behavior
- Early feedback
  - Extremely positive
- Available in Spanish (+/- English subtitles), and English
  
  [https://vimeo.com/161500888](https://vimeo.com/161500888)

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**Dissemination**

- Abstracts and Presentations:
  - International Congress on Rural Health as a social, economic and cultural engine, Lodi, Italy
  - International Conference Rural Health & Ragusa SHWA, Lodi, Italy
  - International Conference on Occupational Stress and Health: Work, Stress, & Health, Atlanta, GA
  - Italian Society of Agricultural Engineers Conference
  - 2 abstracts submitted to ADSA

- Manuscripts:
  - 1 published, 2 submitted

- Other:
  - 3 panels (2 Ag Labor, 1 LSP)
  - PDPW

**THANK YOU**
Significance

- Tractor rollover still the leading cause of agricultural fatalities in the US
- Roll-over Protective Structures (ROPS) virtually eliminate tractor rollover fatalities
- Some post-ROPS tractors do not have ROPS designs

Objective - Develop, implement and evaluate a simple approach to develop 2 post ROPS mechanical drawings from tractor dimensions/mass

Input – Tractor dimensions and mass

Output – Mechanical drawings for ROPS construction

Example - Input Tractor Dimensions (26)
Model designed for tractors with square/grooved axle housings
ROPS Design Decision Criteria

- **Baseplate thickness (RBTH)**
  - If OW < 2000, RBTH = 0.75
  - If OW 2000-3000, RBTH = 1.0
  - If OW 3000-4000, RBTH = 1.25
  - If OW > 4000, RBTH = 1.5

- **Bolt diameter (BD)**
  - If OW < 2000, BD = 0.5
  - If OW 2000-3000, BD = 0.625
  - If OW 3000-4000, BD = 0.75
  - If OW 4000-5000, BD = 0.875
  - If OW > 5000, BD = 1.00

- **Bolt Hole Diameter (BHD)** = BD + 0.125
- **Bolt length (BL)** = 1.0 + 2*RBTH + AHHZ
  - If less than 8, =8. If between 8-10, =10. If between 10-12, =12.
- **Baseplate width (RBX)** = AGSX + 2(BHD) + 2.0

**ROPS Construction Summary**

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<th>Tractor</th>
<th>Weight (kg)</th>
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<th>Bolts ($)</th>
<th>Fabrication ($)</th>
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<td>96.40</td>
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ROPS Test Results

- ROPS Static testing (side, rear and vertical) conducted by FEMCO, MFG.

ROPS allowable deflection is 11.6 inches.
ROPS passes SAE J2194 side load test.

ROPS energy requirement (2619 ft-lb) met at a deflection on 8.7 inches.

ROPS Companies and Contacts

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>David Corn</td>
<td>FEMCO</td>
<td><a href="mailto:david.corn@femcomfg.com">david.corn@femcomfg.com</a></td>
</tr>
<tr>
<td>Jim Schmitt</td>
<td>Custom Products of Litchfield</td>
<td><a href="mailto:ips@800cabline.com">ips@800cabline.com</a></td>
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<tr>
<td>Adam Bechtold</td>
<td>Kubota</td>
<td><a href="mailto:adam.bechtold@kubota.com">adam.bechtold@kubota.com</a></td>
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IH 1066 Tractor ROPS

- ROPS design needed
- Measurements to be taken this summer
- CRDP to produce ROPS drawings

Finite Element Analysis – ROPS Industry interested in Standard Revision and CRDP Validation

Finite Element Analysis

We support tractor safety and the National ROPS Rebate Program

Although most tractors are equipped with ROPS (roll over protective structures), tractor rollovers still lead to the leading source of agricultural fatalities. These在一起 can be prevented by using a ROPS and seat belts.

The National ROPS Rebate Program (NRRP) is providing $250 rebate for tractors to farmers with a certified ROPS and seatbelts. This program is supported by all the major tractor manufacturers.
Operate tractors with foldable ROPS in upright and pinned position

Foldable ROPS allow operators to drive tractors in low sheds and orchards, and under overhead obstructions. But a ROPS folded down does not provide operator protection in the event of a tractor rollover. When the obstruction is passed, the operator should stop the tractor and raise the ROPS to the upright position, with pins inserted, and the seatbelt should be used. Use your tractor safely and KEEP YOUR GUARD UP!
Comparison of Programs

**Community Grants Program**
- Funds intervention, “hands-on” projects
- $10,000 max, one-year project. $35K budgeted annually for external awards.
- Informal internal review, or no review
- HICAHS Staff may be involved throughout project

**Pilot Program**
- Funds research-oriented projects
- $24,000 max, one-year project. $50K budgeted annually for external awards.
- $50K budgeted every year
- Selective peer-review process with external reviewers
- Some HICAHS guidance up-front, very little input thereafter

Comparison of Programs, continued

**Emerging Issues Funds 2011 - 2015**
- Funds “emerging issues” identified by advisory board members, HICAHS staff, or HICAHS Director
- Funds awarded according to Director Stephen Reynolds discretion and input of HICAHS Leadership group. $10K budgeted annually for external awards.
- Variety of projects funded from Ph.D. research to intervention projects, or purchase of subscriptions and services. No standardized process for soliciting or reviewing proposals.
- Award amount varies

FY 2016 Ideas

- March 9 - Board members solicited for ideas on how to spend remaining emerging issues and pilot funds. Ideas due March 22.
- 8 responses received
Topics

- Dairy worker fitness (reformulate)
- Stockmanship Video production (Revise topic)
- Mobile App Production (reformulate)
- Emergency Response to livestock transport accidents (Revise Scope)
- Ph.D. student travel funds (other funds found)

- Variety of dairy industry ideas (reformulate)
- CART / GATOR training (possible community grant)
- Animal and Equipment Training (possible community grant - time)
- Next Food-borne illness (Scope, timing??)

Scott Cotton Idea

“Extricating and Evacuating Livestock From Accidents”

- “Hands on” training exercises of at least 3 trainers in Wyoming, Colorado, and Montana on how to extricate livestock from a wreck.
- Develop 2 training videos and curriculum.

Robert Hagevoort Idea

Dairy Videos

- Develop English and Spanish videos using Articulate Storyline software
- Mobile device compatible
- **Potential Topics:** how cows see, cattle flight zones, moving and handling non-ambulatory cows.
Translation and Dissemination in Agricultural / Forestry Health and Safety

John Rosecrance & David Gilkey
2016 Update on Activities

Focused in 3 Areas

Forestry

Region: Montana, Idaho
Partners: MSU Forestry Extension, MT State Fund, Associated Loggers Exchange, MT Logging Association
Target Audience: 1. Small land owners that cut timber, 2. professional loggers

Products produced for small land owners
Two 12-minute chainsaw safety awareness videos on YouTube.

Escape route should be a 45 angle away from the tree.

Dairy

Ranching
Forestry

Products for professional loggers

1. Developed safety message signage on logging equipment. Implemented pilot program for emergency location of loggers.
2. Safety leadership workshop at Intermountain Logging Conference in Spokane, WA today (J Rosecrance and E Lagerstrom).
4. Analysis of safety culture among all professional loggers in Montana

Dairy

Dairy Tool Box Talks: An Educational Pilot Project – South Dakota State University
Maristela Rovai, Heidi Carroll, Tracey Erickson, Rebecca Foos, Alvaro Garcia

Topics Covered:
- Basic cow knowledge
- Cow housing
- Animal health: cow signals
- Mastitis and somatic cell count
- Milking routine
- Safe hands-on cow handling
- Cultural differences within the labor place
- Animal welfare and risks of animal organization
- Dairy’s success - team interactions
- Final session: assessment and certificate

Ranching and ATVs

Product for Ranchers
Six module ATV safety awareness video
Ranching and ATVs

