WELCOME!

to the

National Stakeholder Webinar Listening Session

RESEARCH, EDUCATION & EXTENSION PRIORITY SETTING FOR

Antimicrobial Resistance (AMR)

Hosted Jointly by

USDA NIFA/ARS/Chief Scientist Office

Tuesday July 19, 11:30am-2:30pm EDT
Welcome Stakeholders

The remaining 13 webinar topics are:

• Turkey
• Swine
• Specialty Farm Species
• Beef
• Cross cutting: Animal Well-being
• Poultry – Broiler/Meat
• Dairy
• Aquaculture
• Sheep
• Cross-cutting: Microbiome
• Poultry – Layer/Breeder
• Goats
• Horses

https://nifa.usda.gov/animal-health-stakeholder-webinar-series
Agenda

• Overview of NIFA, ARS and Office of the Chief Scientist
• Goals of today’s webinar
• Ground Rules
• AMR Presentation – Discussion Leader, Dr. Morgan Scott
  – Preliminary top 5 priorities
• ~20min in-depth discussion on each priority
• Wrap Up
NIFA Overview

Gary Sherman, DVM, PhD
NIFA National Program Leader (NPL) for Veterinary Science, Acting NPL for Animal Agrosecurity
NIFA’s Mission & Vision

• USDA’s primary extramural agency to advance food & agricultural sciences

• We lead & fund initiatives that ensure the long-term viability of agriculture by:
  ➢ Supporting research, education, & extension activities in partnership with institutions and other entities across US (Land-Grant University System, other universities/colleges, government, private, and non-profit)

• AGENCY BUDGET:
  – $1.49 Billion (2016)
  – $1.88 Billion (2017 Request)
NIFA Provides

• **Competitive grants:**
  – Basic & applied research, education, & extension activities
  – Projects that integrate research, education, & extension functions.

• **Capacity grants:**
  – Distributed by formula to Land-Grant Universities, Schools of vet medicine, & other partners to maintain “capacity” to conduct research & extension.
  – 25% research funds → Multi-state Research Committees (including animal health topics)

• **Non-competitive grants:** Directed by Congress to designated institutions for research, education, or extension on topics of importance to a state or region.
NIFA Covers Many Topics

**Advanced Technologies**
- Bioenergy
- Biotechnology
- Nanotechnology

**Animals**
- Animal Breeding
- Animal Health
- Animal Production
- Aquaculture

**Education**
- Minority Serving Institutions
- Teaching and Learning
- Workforce Development

**Environment**
- Climate Change
- Ecosystems
- Invasive Pests and Diseases

**Business and Economics**
- Markets and Trade
- Natural Resource Economics
- Small Business

**Farming and Ranching**
- Agricultural Safety
- Agriculture Technology
- Farmer Education
- Organic Agriculture
- Small and Family Farms
NIFA’s Many Topics Cont’d

Food Science
- Food Quality
- Food Safety

Health
- Nutrition
- Obesity
- Wellness

Natural Resources
- Air
- Forests
- Grasslands and Rangelands
- Soil
- Water

People
- Community Vitality
- Family Well-Being
- Youth

International
- Global Engagement
- Global Food Security

Plants
- Crop Production
- Pest Management
- Plant Breeding
- Plant Health
NIFA’s Animal Disease Funding
By Categories (2010-2014 Avg/year)*

- Animal Diseases (virus, bacteria, prion, non-infectious) -------- $27.7 M / year
- Animal Genome ------------------------------------------------------------- $9.3 M / year
- Zoonotic Diseases & Parasites Affecting Humans ---------------- $4.0 M /year
- Genetic Improvement of Animals (assumed 1/3 for health) ---- $2.6 M /year
- Internal Parasites of Animals --------------------------------------------- $2.2 M / year
- External Parasites of Animals --------------------------------------------- $1.3 M / year
- Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, & other Hazards Affecting Animals ------------------------ $1.2 M / year

- TOTAL INCLUDES ALL AGRICULTURAL ANIMALS----------------------$48.3 M / year

* Data Source: NIFA’s Data Gateway: https://nifa.usda.gov/data
Thank you for participating today!
ARS Overview

Cyril G. Gay, DVM, PhD
Senior National Program Leader
Animal Production and Protection

Office of National Programs
Beltsville, Maryland
Agricultural Research Service (ARS)

- In-house/intramural science research arm of USDA
- Farm-to-table research scope
- Information and technology transfer
- Administration and stakeholder priority setting process
- National Programs
- 700+ projects
- 2000+ scientists and post docs
- 90+ laboratories
- $1.1 billion annual budget
- Partnerships NIFA, universities and industry
- International collaborations
Office of National Programs

- Provide Program Planning & Leadership for ARS funding
- Receive input on ‘high priority’ research needs (relevance)
- Develop Action Plans & research objectives for each research project with the scientists
- Identify opportunities to leverage ARS research activities (intergovernmental, international, national stakeholder groups, regulatory)
- Coordinate research direction across National Programs
# ARS National Programs

<table>
<thead>
<tr>
<th>Natural Resources &amp; Sustainable Agricultural Systems (~20%)</th>
<th>Crop Production &amp; Protection (~35%)</th>
<th>Animal Production &amp; Protection (~15%)</th>
<th>Nutrition, Food Safety &amp; Quality (~30%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Water Availability and Watershed Management</td>
<td>• Plant Genetic Resources, Genomics and Genetic Improvement</td>
<td>• Food Animal Production</td>
<td>• Human Nutrition</td>
</tr>
<tr>
<td>• Climate Change, Soils, and Emissions</td>
<td>• Plant Diseases</td>
<td>• Animal Health</td>
<td>• Food Safety (Plant &amp; Animal Products)</td>
</tr>
<tr>
<td>• Biorefining</td>
<td>• Crop Protection and Quarantine</td>
<td>• Veterinary, Medical, and Urban Entomology</td>
<td>• Quality and Utilization of Agricultural Products</td>
</tr>
<tr>
<td>• Agricultural and Industrial Byproducts</td>
<td>• Crop Production</td>
<td>• Aquaculture</td>
<td></td>
</tr>
<tr>
<td>• Pasture, Forage and Rangeland Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Agricultural System Competitiveness and Sustainability</td>
<td></td>
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</tbody>
</table>
Animal Health
National Program 103

- 2 National Program Leaders
- FY16 Budget: $70 million
- 37 Research Projects
- 9 Locations
- 100 Scientists
- Laboratories with focus
- Specialized scientific expertise
- Linked to 4 National Programs
Animal Health
National Program 103

• **Vision:**
  • To be recognized worldwide as a leader in animal health research with an emphasis on delivering effective solutions to prevent and control animal diseases that impact agriculture and public health.

• **Mission:**
  • To deliver scientific information and tools to detect, control, and where feasible, eradicate animal diseases of high national priority.
1: Biodefense
2: Antimicrobial Resistance
3: Zoonotic Bacterial Diseases
4: Respiratory Diseases
5: Priority Production Diseases
6: Parasitic Diseases
7: Transmissible Spongiform Encephalopathies
ARS National Program Cycle

OMB Research & Development Investment Criteria

- **Relevance**
  - Program Planning & Priority Setting

- **Quality (Prospектив)**
  - Scientific Merit
  - Peer Review

- **Quality (Retrospective)**
  - Program Assessment

- **Performance**
  - Program Coordination
  - Project Implementation
USDA
Office of the Chief Scientist
Overview

Neena Anandarman, DVM, MPH
Senior Advisor on Animals and Animal Products
USDA’s Office of the Chief Scientist

• Strategic coordination of the science that informs the Department's and the Federal government's decisions, policies and regulations that impact all aspects of U.S. food and agriculture and related landscapes and communities

• Departmental coordination across 8 USDA agencies and with federal partners in addressing AMR for the Combating Antibiotic Resistant Bacteria (CARB) National Action Plan (NAP)
USDA’s Office of the Chief Scientist

- CARB NAP Goal 4 is research: Input from stakeholders and USG partners for research priority-setting for AMR for the next 5 years is extremely valuable across USDA agencies since all of the activities of USDA are interconnected and viewed through a One Health lens.
- Research, surveillance, and education and outreach efforts inform each other.
- Information from this workshop will help inform USDA in continually updating its efforts to address AMR while moving forward with our federal partners to implement the CARB National Action Plan.
Animal and Plant Inspection Service
Veterinary Services

Larry Granger, DVM
USDA Antimicrobial Resistance Program Lead
Today’s Goals

• Identify AMR Research, Education and Extension priorities for the next 5 years **from the perspective of animal agriculture**
• By the end of this webinar, identify at least 5 science priorities of greatest importance.
• Express priorities at a level that will effectively inform and guide intramural and extramural science priority setting & solicitation (e.g., not too prescriptive, not too general; see next slide)
• Brainstorm beyond your specific constituency & personal bias
• Along with pre-webinar and post-webinar submitted information, generate core concepts & content of final report
Animal Health & Disease
Program Area Priority Code A1221
Excerpt from 2016 Foundational RFA

Cellular, molecular, genomic/genetic or whole-animal aspects of animal health and disease, especially focusing on one or more of the following:
• Maintenance of homeostasis, including influences of microbiomes on health and disease;
• Disease prevention (e.g., vaccines, diagnostics, enhanced innate or adaptive immunity, disease resistance or susceptibility, or management); or
• Therapeutic interventions for disease reduction/treatment, including alternatives to current antimicrobial treatments.
Ground Rules

- ~20 minutes of discussion on top 5 topics
- ~20 minutes on each topic
  - What specific research questions or initiatives should be prioritized to fill the gaps within each topic?
  - What extension and education needs exist pertaining to the topic?
  - What new tools or methodological innovations are needed to effectively address high-priority knowledge gaps, and/or education/extension needs?

- Keep comments short
- Provide full comments via webchat or email if Notes don’t capture your full intent
Animal Health Stakeholder Webinar - Antimicrobial Resistance

USDA-NIFA Division of Animal Systems,
USDA-ARS Animal Health
USDA Office of the Chief Scientist

June 19, 2016 11:30 EDT

H. Morgan Scott DVM, PhD
College of Veterinary Medicine and Biomedical Sciences
Texas A&M University
College Station, Texas, U.S.A.

hmscott@cvm.tamu.edu
Purpose

“USDA's Office of the Secretary, USDA-NIFA’s Division of Animal Systems & USDA-ARS Animal Protection and Production programs are hosting this webinar to solicit comments on where USDA can best focus its limited resources and efforts across programs involving antimicrobial resistance in the context of animal health”.
Overview

• Some points for consideration
• Set of slides developed from pre-webinar stakeholder input
  – 5 major themes
    • Research, extension/outreach, education
  – Additional uncategorized themes
• Webinar stakeholder inputs
Points for consideration

• In the context of ‘animal health’
  – Generally speaking, focusing on those areas with the potential to impact animal health; either negatively or positively, as efforts are made to mitigate AMR
    • Research, extension/outreach, education efforts to address these areas
  – Focus here is not directly on potential public health risks, though such influence is clearly present
Release assessment: Describes the probability that factors related to the antimicrobial use in animals will result in the emergence of resistant bacteria or resistance determinants (RzD).

Exposure assessment: Describes the likelihood of human exposure to the RzD through particular exposure pathways.

Consequence assessment: Describes the relationship between specified exposures to the RzD (the hazardous agent) and the consequences of those exposures (CVM-defined hazard).

Macrolide is ineffective

Risk assessment framework

Hurd (Microbe, 2006)
Classification of antibiotic uses in animal agriculture

• Broadly speaking:
  – 1) Treatment,
  – 2) Control,
  – 3) Prevention,
  – 4) Growth promotion / production efficiency

‘Therapeutic use’

• Phased out on December 31, 2016 via GFI 209/213
## Antibiotic uses in animal agriculture

### Antimicrobial Drugs Approved for Use in Food-Producing Animals Actively Marketed in 2014

**Domestic Sales and Distribution Data Reported by Medical Importance and Drug Class**

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Annual Totals (kg)</th>
<th>% Subtotal</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medically Important</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Aminoglycosides</td>
<td>304,160</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>31,722</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td>17,220</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Lincosamides</td>
<td>233,681</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Macrolides</td>
<td>621,769</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td>Penicillins</td>
<td>885,975</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>Sulfas</td>
<td>452,224</td>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td>Tetracyclines</td>
<td>6,600,849</td>
<td>70%</td>
<td>43%</td>
</tr>
<tr>
<td>NIF²</td>
<td>328,389</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>9,475,989</strong></td>
<td><strong>100%</strong></td>
<td><strong>62%</strong></td>
</tr>
<tr>
<td><strong>Not Currently Medically Important</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ionophores</td>
<td>4,718,650</td>
<td>80%</td>
<td>31%</td>
</tr>
<tr>
<td>NIF²</td>
<td>1,163,571</td>
<td>20%</td>
<td>8%</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>5,882,221</strong></td>
<td><strong>100%</strong></td>
<td><strong>38%</strong></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>15,358,210</strong></td>
<td><strong>100%</strong></td>
<td><strong>100%</strong></td>
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</tbody>
</table>
Relevance to U.S. animal agriculture?

Colistin resistance: mcr-1
"To preserve the effectiveness [of antibiotics], we simply must use them as judiciously as possible"

Dr. Joshua Sharfstein, then US FDA deputy commissioner, in June of 2010 suggesting that antibiotics should only be used to protect the health of an animal and not to help it grow faster or more efficiently
Stakeholder input

• **Source**
  – Via website
  – E-mail
  – 3rd party (other USDA efforts)

• **Categorized by theme**
  – Semi-quantitative
  – Overlap

<table>
<thead>
<tr>
<th>Theme</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication/Extension/Guidelines on proper use</td>
<td>6</td>
</tr>
<tr>
<td>Balanced epidemiologic approach</td>
<td>5</td>
</tr>
<tr>
<td>Defining risks of antibiotic use in food animals</td>
<td>4</td>
</tr>
<tr>
<td>Emphasis on herd health management practices +/- treatment regimen optimization</td>
<td>4</td>
</tr>
<tr>
<td>Need for diverse antibiotic choices (finfish, minor use)</td>
<td>3</td>
</tr>
<tr>
<td>Alternative strategies to antimicrobials</td>
<td>3</td>
</tr>
<tr>
<td>Public outreach on importance of antibiotic to animal health</td>
<td>3</td>
</tr>
<tr>
<td>Optimal duration of exposure to balance efficacy with pressure</td>
<td>2</td>
</tr>
<tr>
<td>Balance production efficiency with conservation of Abx</td>
<td>2</td>
</tr>
<tr>
<td>Mitigation Steps - Systems level</td>
<td>2</td>
</tr>
<tr>
<td>Consumer perception</td>
<td>2</td>
</tr>
<tr>
<td>Need for vaccines to avoid Abx use</td>
<td>1</td>
</tr>
<tr>
<td>Vector Control</td>
<td>1</td>
</tr>
<tr>
<td>Best practices from outside US</td>
<td>1</td>
</tr>
<tr>
<td>Model curriculum/Space to share curriculum</td>
<td>1</td>
</tr>
<tr>
<td>&quot;Alternative&quot; Commercialization</td>
<td>1</td>
</tr>
<tr>
<td>Animal/Pathogen breakpoints</td>
<td>1</td>
</tr>
<tr>
<td>Standardized Genomic Indicators</td>
<td>1</td>
</tr>
<tr>
<td>Identification of management practices that lead to AMR</td>
<td>1</td>
</tr>
<tr>
<td>Selection pressure changes vs. genetic acquisition</td>
<td>1</td>
</tr>
<tr>
<td>Environmental Interactions/ Biome</td>
<td>1</td>
</tr>
<tr>
<td>Gut Microbiome +/- role of commensals in AMR Emergence &amp; Spread</td>
<td>1</td>
</tr>
<tr>
<td>Attributable/validated Risks to Human Health</td>
<td>1</td>
</tr>
<tr>
<td>Address Veterinarian Shortages</td>
<td>1</td>
</tr>
<tr>
<td>Address Small Producer Challenges</td>
<td>1</td>
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</tbody>
</table>
Extension/outreach/education - specific themes

• Communication via extension/outreach including guidelines on proper use of antibiotics
  – Stewardship/judicious use/Veterinary Feed Directive
  – QA programs
• Public outreach concerning importance of antibiotics to animal health
  – Efforts to understand consumer perceptions and concerns
• Need for a model curricula to improve awareness and understanding of antimicrobial resistance
Stakeholder input research Theme #1: Risk analysis approaches

• Balanced epidemiologic approach / optimizing varying analytical approaches
  – Multiple ways to evaluate data endpoints
    • Isolate-based AMR prevalence by bacterial species, single/multi-resistance including whole-genome sequencing
    • Microbial ecology (quantitative approaches with indicator species)
    • Meta-genome/resistome approaches

• Defining risks of antibiotic use in food animals
  – Understand risk factors for above, & where in food chain
    • Direct selection by antibiotics
    • Co-selection by antibiotics or alternatives
    • Indirect selection via management/nutrition, etc.
Stakeholder input research Theme #2: Optimize antibiotic therapy

- Optimize antibiotic treatments to minimize resistance while maximizing animal health benefits
  - Develop and employ rapid diagnostics to reduce unnecessary and ineffective treatments
  - Better define risk/benefits of various uses/routes of administration/dosage regimens
  - Ensure optimal duration of exposure to balance selection pressures with efficacy
  - Establish in relation to animal/pathogen breakpoints
  - Consider changing bacterial populations over time (plasmid acquisition, fitness)
Stakeholder input research Theme #3: Alternative approaches to health

• Emphasis on herd health management practices, including treatment regimen optimization, and alternatives
  – Management approaches to minimize need for antibiotics
    • Vaccines, biosecurity, animal handling, weaning, transport, stress
  – Alternatives to antibiotics
    • Non-specific immune modulators, phage therapy, metals, host peptides, etc

• Mitigation strategies employing ‘systems approaches’
• Examine ‘best practices’ from elsewhere
Stakeholder input research Theme #4: ‘One Health’ challenges

• Expanded from food chain to include environmental interactions / microbiome of within/without host
  – Vector control
• Importance of indicator/commensal organisms versus pathogens in selection and expansion of resistance
Stakeholder input research Theme #5: Underserved/represented groups

• Need for diverse treatment options (including antibiotics) for ‘minor species’, aquaculture (including finfish), and other persons/groups/regions
  – Address small producer challenges
  – Address veterinarian shortages
  – Alternative commercialization pathways
AMR Discussion
After today?

• Review and analysis of all comments provided via webinar or other mediums

• Final report in 2017

• Use report to inform the development of RFAs and Scientific Priorities
Thank you for Participating!

Having some important after-thoughts? Remember: you may continue to email input to animal.health@nifa.usda.gov (AMR in the subject line) until Friday, July 29.

Please direct questions or comments related to this AMR webinar to: Gary Sherman: gsherman@nifa.usda.gov; 202-401-4952