Minutes of the Annual Meeting of Multi-State Project S1076

Fly Management in Animal Agriculture Systems and

Impacts on Animal Health and Food Safety (2019-2024)

January 5-8 (11amEST-2pmEST) Virtual via Zoom

In attendance:

**Name Affiliation Email**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

John Stoffolano University of Massachusetts [stoff@umass.edu](mailto:stoff@umass.edu\Rich)

Rich Meisel University of Houston [rpmeisel@central.uh.edu](mailto:rpmeisel@central.uh.edu)

Ted Burgess University of Florida [edwinburgess@ufl.edu](mailto:edwinburgess@ufl.edu)

Erika Machtinger Penn State [etm10@psu.edu](mailto:etm10@psu.edu)

Alex Lehman University of Nebraska [Alexander.Lehmann@huskers.unl.edu](mailto:Alexander.Lehmann@huskers.unl.edu)

Caleb Hubbard University of California Riverside [caleb.hubbard@email.ucr.edu](mailto:caleb.hubbard@email.ucr.edu)

Amy Murillo University of California Riverside [amy.murillo@ucr.edu](mailto:amy.murillo@ucr.edu)

Alec Gerry University of California Riverside [Alec.Gerry@ucr.edu](mailto:Alec.Gerry@ucr.edu)

Bethany McGregor USDA-ARS-ABADRU [Bethany.McGregor@usda.gov](mailto:Bethany.McGregor@usda.gov)

T.C. Crippen USDA-ARS-SPARC [tc.crippen@usda.gov](mailto:tc.crippen@usda.gov)

Sara Neupane Kansas State University [sneupane@ksu.edu](mailto:sneupane@ksu.edu)

David White University of Tennessee [DWhite25@utk.edu](mailto:DWhite25@utk.edu)

Daniel Asgari University of Houston [dasgari@uh.edu](mailto:dasgari@uh.edu)

Victoria Pickens Kansas State University [vlpicken@ksu.edu](mailto:vlpicken@ksu.edu)

Tanya Purvis USDA-ARS-ABADRU [Tanya.Purvis@usda.gov](mailto:Tanya.Purvis@usda.gov)

Caitlin Taylor University of Florida [llamataylor@ufl.edu](mailto:llamataylor@ufl.edu)

Kiran Adhikari University of Houston not provided

Brandon Hall Kansas State University [brandonhall98@ksu.edu](mailto:brandonhall98@ksu.edu)

Katy Smith University of Tennessee [katvsmit@vols.utk.edu](mailto:katvsmit@vols.utk.edu)

Cassandra Olds Kansas State University [colds@ksu.edu](mailto:colds@ksu.edu)

Edward Bird Kansas State University [edwardbird@ksu.edu](mailto:edwardbird@ksu.edu)

Kim Lohmeyer USDA-ARS Kerrville [kim.lohmeyer@usda.gov](mailto:kim.lohmeyer@usda.gov)

Zain Syed University of Kentucky [zsy224@uky.edu](mailto:zsy224@uky.edu)

Emily McDermott University of Arkansas [emcdermo@uark.edu](mailto:emcdermo@uark.edu)

Perot Saelao USDA-ARS Kerrville [perot.saelao@usda.gov](mailto:perot.saelao@usda.gov)

Roger Moon University of Minnesota (retired) [Rdmoon@umn.edu](mailto:Rdmoon@umn.edu)

Lakshmi Matukumalli USDA-NIFA [lakshmi.matukumalli@usda.gov](mailto:lakshmi.matukumalli@usda.gov)

Brad Mullens University of California Riverside [Mullens@ucr.edu](mailto:Mullens@ucr.edu)

Kyle Harrison USDA-ARS AMR [kyle.harrison@usda.gov](mailto:kyle.harrison@usda.gov)

Doug Ross Control Solutions, Inc. [doug.ross@controlsolutionsinc.com](mailto:doug.ross@controlsolutionsinc.com)

Brandon Smythe New Mexico State University [bsmythe@nmsu.edu](mailto:bsmythe@nmsu.edu)

Justin Talley Oklahoma State University [justin.talley@okstate.edu](mailto:justin.talley@okstate.edu)

Barbara Hull Y-Tex [bhull@y-tex.com](mailto:bhull@y-tex.com)

Dave Boxler University of Nebraska North Platte [dboxler1@unl.edu](mailto:dboxler1@unl.edu)

Gary Brewer University of Nebraska Lincoln [gbrewer2@unl.edu](mailto:gbrewer2@unl.edu)

Dana Nayduch USDA-ARS-ABADRU [Dana.Nayduch@USDA.GOV](mailto:Dana.Nayduch@USDA.GOV)

Kateryn Rochon University of Manitoba [Kateryn.Rochon@umanitoba.ca](mailto:Kateryn.Rochon@umanitoba.ca)

Luisa Domingues Texas A&M [dominguesln@gmail.com](mailto:dominguesln@gmail.com)

Sonja Swiger Texas A&M AgriLife Extension [Slswiger@ag.tamu.edu](mailto:Slswiger@ag.tamu.edu)

Chris Geden USDA-ARS Gainesville [Chris.Geden@usda.gov](mailto:Chris.Geden@usda.gov)

Georgina Bingham Vestergaard [gvb@vestergaard.com](mailto:gvb@vestergaard.com)

Pia Olafson USDA-ARS Kerrville [Pia.Olafson@usda.gov](mailto:Pia.Olafson@usda.gov)

Xing Ping Hu Auburn University [huxingp@auburn.edu](mailto:huxingp@auburn.edu)

Nancy C. Hinkle University of Georgia [Nhinkle@uga.edu](mailto:Nhinkle@uga.edu)

Jeff Scott Cornell University [Jgs5@cornell.edu](mailto:Jgs5@cornell.edu)

Chris Holderman Central Life Sciences [cholderman@central.com](mailto:cholderman@central.com)

Phil Kaufman Texas A&M [pkaufman@tamu.edu](mailto:pkaufman@tamu.edu)

Aaron Tarone Texas A&M [tamlucilia@tamu.edu](mailto:tamlucilia@tamu.edu)

David Taylor USDA-ARS Lincoln (retired) [dtaylor1@unl.edu](mailto:dtaylor1@unl.edu)

Wes Watson North Carolina State University [wwatson@ncsu.edu](mailto:wwatson@ncsu.edu)

Jerry Hogsette USDA-ARS CMAVE [Jerry.Hogsette@usda.gov](mailto:Jerry.Hogsette@usda.gov)

Becky Trout Fryxell University of Tennessee [rfryxell@utk.edu](mailto:rfryxell@utk.edu)

Gary Thompson University of Arkansas (SAAESD) [gat009@uark.edu](mailto:gat009@uark.edu)

Jamie Freeman Cornell University [jcf236@cornell.edu](mailto:jcf236@cornell.edu)

Xinmi Zhang Univ. California Riverside [xinmi.zhang@email.ucr.edu](mailto:xinmi.zhang@email.ucr.edu)

Mike Fletcher Y-Tex [mfletcher@y-tex.com](mailto:mfletcher@y-tex.com)

Pablo Delclos University of Houston [pdelclos@uh.edu](mailto:pdelclos@uh.edu)

Laura Harmon University of Florida not provided

Katy Smith University of Tennessee [katvsmit@vols.utk.edu](mailto:katvsmit@vols.utk.edu)

The Annual Meeting of Multi-State Project S1076 met virtually this year over a several day period (January 5th to the 8th) due to the COVID-19 pandemic. This led to flexible scheduling and attendance fluctuating at times throughout the meeting, however, approximately, 30-50 attendees were present in the Virtual Zoom Room at any point in time. It was noted that this method allowed for more students to share their work, but limited the amount of discussion available for collaboration around certain objectives.

**Day 1:**

Meeting called to order by **Becky Trout Fryxell** at 11 AM. First order of business was a round of self-introductions by the attendees listed above.

**Dave White** gave his report as group advisor. He reminded the group that the minutes are due within 60 days of the end of the meeting. He said that the project seems to be moving along well. He pointed out that federal agencies now have their budgets. The AFRI budget received a small increase and Hatch received level funding. Dave then introduced Lakshmi Matukumalli, who was with NIFA.

**Lakshmi Matukumalli** gave a report on the status of NIFA, which he also provided as a file via email that is attached to this report. He recently made the move from DC to Kansas City when NIFA was relocated. They lost about 75% of the staff during the transition, so there have been quite a few changes. The new NIFA director is Dr. Carrie Castille. Other personnel changes can be seen in the attachment to the minutes. Three RFA’s for AFRI programs have been or will be announced:

1. Sustainable Agricultural Systems (RFA for FY 2020-2021 is was released Fall 2020).

2. Education and Workforce Development (RFA for FY 2020 released July 16, 2020; RFA for FY 2021-2022 is pending and to be released Fall 2020, or early Winter 2021). Includes pre- and postdoctoral fellowships, undergraduate experiential learning, and K-14 educational programs).

3. Foundational and Applied Sciences (RFA for FY 2021-2022 released July 17, 2020)

a. Animal Health and Production and Animal Products

b. Crosscutting Programs

* Critical Agricultural Research and Extension (CARE)
* Data Science for Food and Agricultural System (DSFAS)
* Inter-Disciplinary Engagement in Animal Systems (IDEAS)
* Tactical Sciences for Agricultural Biosecurity

**Wes Watson** then led the discussion for **Objective 1, New technologies for management of biting and nuisance flies in organic and conventional systems**.

**Dave Boxler** presented a study done with **Gary Brewer** on the use of traps and repellents for a push-pull approach to stable fly management. The “push” was weekly application of fatty acid mixtures, the “pull” the use of KnightStick traps with an added olfactory lure of 1 mg of m-cresol in acetone. Untreated animals served as negative control and permethrin treatment as a positive control. Dry weather resulted in low overall stable fly populations. There was no difference between the permethrin and the push-pull treatments, and only modest differences between the two treated groups and the negative controls. Dave feels that the fatty acid mixture needs to be applied more frequently than once a week to be effective. Daily applications may be needed, perhaps with the use of an automated sprayer.

**Becky Trout Fryxell** discussed the use of neural network technology to improve horn fly counts. Flies on animals are photographed, and the system is trained by marking flies on the photos in MS Paint. The method was highly effective and more accurate than human counters. Best counts came from images taken between 3.1 to 4.6m, but some images were taken at nearly 100m. Quality of camera can capture pictures from 100 meters away. There is a trade-off between image quality and processing time. Images of very high quality are the most accurate, but have slow upload speeds. The paper is presented here: <https://www.sciencedirect.com/science/article/abs/pii/S016816992033132X>.

**Dave Boxler** presented information on ear tags for horn flies. The Y-Tex Tri-Zap tag contains abamectin, PBO, and zeta-cypermethrin. These tags worked well for about 8 weeks. Bayer’s Tolfenpro tag contains tolfenpyrad, a new active ingredient (class 21A). In two trials, the tags lost their effectiveness in about 3 weeks. **Justin Talley** said that he had seen similar results in Oklahoma. **Dave** and **Justin** both said that their horn fly populations have been higher later in the season lately because of warmer temperatures.

At this point, **Gary Thompson** joined the call to introduce himself. Gary is the new Director of the Southern Association of Agricultural Experiment Station Directors and is located at the University of Arkansas.

**Wes Watson** presented on tests of *Beauveria bassiana* (strains L90 and P89) against adult face flies. These two strains were originally isolated from house flies on NY dairies. Conidia (dose=1.5 x 108) were mixed with flour and shaken with the flies. Nearly all of the flies were dead after 10 days, with many of the cadavers producing fungal blooms.

**Zain Syed** discussed a recently published paper on screwworm attraction to wound and animal odors. The paper can be found here: <https://doi.org/10.1038/s41598-020-77541-w>. Swormlure is a malodorous composite material of several constituents that is used to monitor screwworm adults. They looked at antennal responses to 9 odors. P-cresol elicited the strongest response. Primary and secondary screwworms differed somewhat in their responses, as did male and female flies. One problem with swormlure is that it is not very good at attracting males. The authors looked for mRNA for odorant binding proteins and found a number of genes that are found more abundantly in males. They also found that mated and unmated female flies differed in their cuticular hydrocarbons. This could help in identifying odors that will attract males.

**Chris Geden** reported on attempts to select for faster-killing *B. bassiana* using 5 strains that **Alex Pagac** and **Erika Machtinger** had obtained from house flies on PA poultry farms. After 10 generations there was little change in virulence, but two of the strains were found to be much more virulent than the others and had superior growth properties. He also reported on field trials of mass releases of the larval parasitoid *Tachnaephagus zealandicus* in Alabama poultry houses. Results from those releases are still pending.

**Wes Watson** discussed an effort to develop an alternative power source for the Cow-Vac trap. They have a prototype that uses a solar powered lawn mower battery that starts a propane-powered engine when a cow enters the device. The prototype is modification of the standard Spaulding Cow-Vac and has sophisticated electronics. A whip switch activates the vac to run for three minutes after an animal enters. Operating costs are $0.44/day for the cost of the propane. The trap worked particularly well on stable flies.

At this point **Erika Machtinger** and **Becky Trout Fryxell** gave an update on the special collection of fly review papers for the Journal of Integrated Pest Management.

* Intro paper (Machtinger): Has been reviewed. Will resubmit when all other papers are done.
* House fly (Geden): Done, reviewed, and page proofs finished
* Face fly (Trout Fryxell): Done, reviewed, and page proofs finished
* *Fannia* (Murillo): Done, reviewed, and page proofs finished
* Horn fly (Brewer): Pending submission
* Stable Fly (Rochon); Still in development. Dave Taylor is trying to tie things together. Not quite ready to send out to S1076 membership.
* New paper on economics of fly pressure. To be developed by Katy Smith and Becky Trout Fryxell.

**End of Day 1**

**Day 2:**

**Phil Kaufman** led the discussion for **Objective 2,** **Insecticide resistance detection and management.**

**Caleb Hubbard** presented his research on imidacloprid resistance in house flies, especially behavioral resistance. Caleb selected 5 lines of flies for behavioral resistance to imidacloprid. After 10 generations there was 100% survival in the selected flies. The selection did not result in physiological resistance. Observations of the flies with cameras showed that selected flies spent less time visiting and touching imidacloprid+sugar than sugar alone. These flies preferred dinotefuran+sugar over imidacloprid+sugar. He found that the resistance factors are located on autosomes 1 and 4, with the genes on the two autosomes doing the same thing in terms of fly behavior. He plans to look at allele frequency changes, electrophysiological responses, tarsal ablations, comparison with other neonicotinoids, and a survey for behavioral resistance in the US.

**Jamie Freeman** presented work that she has done with Jeff Scott on bulked segregant analysis of pyrethroid resistance in house fly. There are 2 main resistance mechanisms: VSCC modifications (*kdr*) and overexpression of cytochrome P450 (CYP). The latter mechanism is harder to monitor because there are many proteins potentially involved and the resistance is often due to overexpression, which can result from many types of genomics changes. She started with a highly resistant strain from Kansas. PBO and DEF reduce the resistance, which is linked most strongly to chromosome 3 followed in order by 5, 2, and 1. The flies were allowed to mix with susceptible flies over 6 generations and they looked at the most and least susceptible flies in the final generation to find regions of differentiation between them in the genome. Genomic analysis with a new, long-read genome assembly indicates that the strongest resistance signals are on chromosome 3 and chromosome 5. The signal on chromosome 3 is located near *kdr* and the signal on chromosome 5 is near a cluster of 24 CYPs. Conclusion: this approach works to find multigenic phenotypes and will lead to the narrowing down of the CYPs involved in pyrethroid resistance. When asked by Pia Olafson about which family of CYPs were involved, Jamie said they were mostly in 6A, and that the particular CYPs of interest in the cluster have not previously been found to be associated with pyrethroid resistance.

**Jeff Scott** announced that he and Ted are interested in seeing whether we can select for resistance to fluralaner. Please help Jeff by sending him pupae from good-sized wild flies this fly season. Jeff will send out an email to the group outlining what they need.

This concluded Objective 2

**Amy Murillo** announced that she is looking for volunteers to help with national commercial pest survey. She is mainly interested in ectoparasites of egg layers and will send traps to people who want to participate.

**Dana Nayduch** then led the discussion on **Objective 3, Investigation of the microbial ecology, epithelial immunity, and vector competence of biting and nuisance flies**.

**Aaron Tarone** is examining *Lucilia sericata* larvae gene expression in response to bacteria. Antimicrobial protein (AMP) responses to bacteria are strong when injected, but weak when ingested. Ingestion of *Pseudomonas* elicits a broad / strong response; however, Acinetobacter appears to be a limited response and with expression patterns indicative of gut damage. Octanoic acid also elicits a strong response of these genes in *Drosophila*. Perhaps this is because it damages the peritrophic matrix (PM), as it elicits upregulation of genes known to be involved in repairing the PM.  Possible to use combinations of chemicals and bacteria to improve insect killing? Aaron is collaborating with the Los Alamos lab and Jeff Tomberlin; they are evaluating microbes in blow flies including in wild populations.

**Daniel Asgar** discussed constitutive defenses versus induced responses to microbes. AMPs can be induced by an infection but also occur constitutively in the gut of stable fly. He fed *E. coli* and *P. aeruginosa* to house flies and found that AMPs were induced by *P. aeruginosa* but not to *E. coli*. There was an increase in transcriptomic responses after feeding on P. *aeruginosa*. The fly gut has highly constitutive AMPs including defensins and stomoxyn (in stable fly). TFBSs are enriched for highly constitutive AMPs. Myc is a base transcriptomic factor that controls cell size. HIF-1 is also highly enriched and leads to production of defensin.

**John Stoffolano** presented on a range of topics, which are briefly summarized below:

* House flies infected with Salivary Gland Hypertrophy Virus (SGHV) take up less food than uninfected flies.
* Ultrastructural examination of house fly salivary glands revealed that the glands of healthy flies are lined with cuticle but that this cuticular lining is dissolved in flies infected with SGHV.
* Low dose infection of flies with SGHV does not result in the salivary gland hypertrophy symptom that is commonly associated with this virus.
* ORF virus of sheep is enzootic and also infects people. Flies are highly attracted to secretions around the muzzle of infected sheep. Flies feed on these secretions carry, the virus on the legs, and disseminate virus particles when they groom. Virus can be recovered from the regurgitant, crop and feces of exposed flies.
* Trachoma, the #1 cause of blindness in the world, is caused by *Chlamydia trachomatis* and usually transmitted by *Musca sorbens*. However, *M. domestica* is also a good vector, and bacteria can be found in the crop, midgut, and regurgitant. Bacteria are present in the crop 7 days after ingestion.

**Sara Neupane** presented work on microbial community diversity in house flies and rearing substrate. In the first project, she documented that larval grazing affects the microbial community of manure. Fresh manure (with no fly larvae) was dominated by *Methanobrevibacter*. Larval grazing inhibited these bacteria but promoted *Methanocurpusculum*. Grazing also reduced the total bacterial diversity in manure but increased diversity of eukaryotes; fungi were not affected. Manure aging reduces the proportion of bacteria that are associated with the gut and rumen of the animal. In a second project, she examined flies collected from agricultural, urban and mixed habitats. Pathogens were present in flies from all habitats. Flies from the agricultural habitat had the greatest bacterial diversity and had high proportions of *Corynebacterium* and *Acinetobacter*.

End of Objective 3 for now – additional presentations to be given on Day 4

**End of Day 2**

**Day 3:**

**Wes** **Watson** announced that **Mike Fletcher** would be joining us on Day 4 for a tribute to Craig Turner and Bob Pennington, who both passed away in 2020.

**Ted Burgess** led the discussion of **Objective 4: Characterize population biology of biting and nuisance flies**.

**Xinmi Zhang** gave a presentation on seasonal and daily host-seeking activity of *Culicoides sonorensis*. This species is crepuscular and occurs year-round in CA. She used time-segregated CO2-baited traps on dairy farms to monitor activity. Flies were most abundant in June-August. They were most abundant at sunset in the Spring, after sunset in Summer and Fall, and before sunset in Winter. Xinmi will be looking at interactions of environmental effects on activity, seasonal changes in parity rates, and the overwintering of bluetongue virus.

**Kiran Adhikari** and **Richard Meisel** are studying the stable maintenance of polygenic sex determination in house flies. In the northern US and Japan, maleness is conferred by the sex chromosome (YM); whereas, in Florida the male genes are on autosome 3 (IIIM). Why is this? Do the different positions of the male genes give an advantage in cold or warm climates? They reared flies at different temperatures and tested them for heat and cold tolerance – results supported the hypothesis that YM males were more cold-tolerant and that IIIM males were more heat tolerant. When given a choice of temperatures along a gradient, flies that were reared at hot temperatures sought cooler places. However, when flies reared at cooler temperatures YM flies preferred cooler temperatures whereas IIIM males preferred warmer temperatures. A long discussion followed.

**Pablo Delclos** continued the discussion of sex determination in house flies with his work. In cages, IIIM males outcompete YM males for mates and will drive the YM males to extinction. How is the cline maintained in nature? Pablo did not see much difference in enrichment of 30 differentially expressed genes. Nor did he see much difference in effects of temperature on IIIM and YM mating success. However, IIIM males have lower expression of odorant binding protein (OBP) OBP56H than YM males. Low expression of the same OBP is known to enhance male mating success in Drosophila. Part of the advantage of IIIM males appears to be due to copulation latency; IIIM males mate faster than YM males.

**Ashlynn Fucello** reported on work documenting genetic variation in stable fly populations. She examined 171 flies and used a genotype by sequencing (GBS) app to analyze 2 sets of SNPs. One set had 13,000 SNPs and the other had 50,000. Most of the SNPs were biallelic, and 24 and 34% of the SNPs in the two sets were in disequilibrium. Several scaffolds of interest and a SNP for *kdr* were found. The data will be used to examine population structure in stable flies.

**Laura Harmon** looked at pesticide use on deer farms in Florida. The deer industry is growing, with 7800 farms in the US, but little is known about their pest problems and how the industry deals with them. Her survey of 32 Florida deer farmers showed that the pests of concern include stable flies, ticks, mosquitoes, tabanids, and *Culicoides*. Permethrin was the most commonly used insecticide, and foggers were the most commonly used method of application. *Culicoides* problems occurred in May-October, especially in June-September. Laura also tested *C. stellifer*, *C. insignis* and *C. furens* from 4 sites for susceptibility to permethrin using the CDC bottle assay and found no evidence for resistance.

**Erika Machtinger** reported on a project looking at fly populations associated with hog farms in North Carolina. The work was prompted by a lawsuit in which Smithfield Farms paid $473 million in a lawsuit over nuisance complaints that included flies. House flies were the dominant fly species, but *Hydrotaea* spp. were common as well. Populations were highest in May-June. There was little difference in spot card counts from cards placed on the inside or outside of posts. KnightStick traps placed at varying distances away from the houses mainly collected stable flies.

This concluded Objective 4.

**Alec Gerry** then began the discussion of **Objective 5, Objective 5. Extension and community engagement.**

**Erika Machtinger** has taken over the [www.VeterinaryEntomology.org](http://www.VeterinaryEntomology.org) website. The website is now managed by a committee of 10 people. Erika’s detailed report on the website is appended to these minutes and includes analytics for numbers of visits, the duration of the visit, the country from which the visits were made, how people got there, and the most popular pages visited (sticktight fleas). She also reported on where we still have needs to develop Pest Bios and who volunteered to write them (also in the attached report). There was also a discussion of how to improve engagement, perhaps by coordinating with commodity groups, and connecting with the National eXtension’s “Ask an Expert” instead of us trying to run Q and A from the website. **Alec** said that he would start a list of people who would like to be listed as an expert for “Ask an Expert”. Finally, this from **Erika**: “We are looking for others that are interested in participating in the website project to join our committee! Please reach out to me with your interest. NOTE: Just because you are on the committee doesn't mean you have to know anything about building or maintaining a website. You may be interested in being involved to increase engagement, or you think you could link organizations together, or maybe you have a brilliant idea that we haven't thought of. We are interested in all of that!”

**Wes Watson** presented results of survey of mid-Atlantic and midwestern dairies. There were 55 conventional and 9 organic dairies among the respondents. Their biggest concerns were pinkeye, insects and heat stress. The pests that concerned them were horse flies, horn flies, stable flies, face fly and house flies. The respondents were concerned both about cow comfort and the economic effects. The most common methods of pesticide application were pour-ons, sprays, and occasional feed-throughs. Sticky traps were the most common type of trap used. Parasitoid releases were practiced by 8 out of the 64 respondents. The most commonly used cultural controls were manure spreading, composting, and pasture rotation.

**Katy Smith** conducted a survey of farm demographics of cow-calf operations in TN and TX, especially with regard to horn fly management. There were 786 respondents. The average cost of horn fly management was $10.16 per head ($9.50 for TN and $12.35 for TX). A Tobit model and quantile regression with 7 model components was run. Significant model terms were whether the respondent had a college degree, whether the cattle were Angus, and the number of acres. Higher costs were also associated with whether fly problems continued into the Fall. Producers are making fly management decisions based on perceptions rather than science.

**Alec Gerry** wrapped up the day with demonstration of Vet PestX, a part of the [www.VeterinaryEntomology.org](http://www.VeterinaryEntomology.org) website. A discussion followed about the challenges of keeping the pesticide database up to date.

**End of Day 3**

**Day 4:**

The first part of the day was devoted to continuing the discussion of Objective 3, as there were several presentations that could not be given on day 2 due to time constraints.

**Sara Neupane** reported on a survey of the bacterial communities associated with flies on dairy versus beef cattle farms in OK, KS, and NE using the V4 region of the 16s rRNA. There was little difference in the relative prevalence of higher bacterial taxa. *Moraxella* and *Mycoplasma* were more common on beef farms, whereas *Corynebacterium* was more common on dairies. In OK and KS, diversity was higher in flies on beef than cattle farms, whereas in NE diversity was higher in flies from dairies. Overall diversity was higher in more northern locations. Antibiotic resistance genes (9 were tested) were widespread, and tetracycline resistance was particularly common.

**John Stoffolano** discussed research with chitosan, which is toxic for many insects and has many applications, including use on plants as an antifungal agent and in human medicine to treat diabetes. In no-choice assays, *Tabanus nigrovittatus* that fed on chitosan died in 4.6 days compared to 16 days among controls. House fly mortality was much faster (2 days) perhaps because of effects on gut microbes. John is now working on new formulations of chitosan using clay nanoparticles. **Dana Nayduch** suggested that it may be inducing an immune response in the flies.

**Victoria Pickens** presented on bacterial carriage and AMR resistant bacteria from house flies on KS feedlots and dairies. In contrast to **Sara Neupane**’s work, this project was done using culture-based methods that focused on coliforms. More coliforms were found in female than male flies. Flies from beef farms had higher prevalence of tetracycline resistance than those from dairies. She also looked at gram-negative bacteria from flies as well as the environment. Again, female flies had higher bacterial carriage loads. Overall, 75% of flies collected from feedlots carried AMR bacteria. Of the environmental samples, bacterial counts were highest in fresh manure and lower in cattle feed and dry manure.

**Becky Trout Fryxell** presented work done by student **Emily Luc** on effects of horn fly loads and mastitis on milk quality and yield in organic dairy herds. Emily found no correlation between somatic cell counts and fly loads, but did see a correlation between fly loads and milk yield. Milk yield was also affected by temperature, humidity, days that the animal had been milked, and parity. In second study, the percentage of flies carrying *Staphylococcus* spp. was a good predictor of mastitis. The most common *Staphylococcus* species found was *S. aureus*, followed by *S. chromogenes* and *S. agnetis*. Flies collected from the udders were most often positive for *Staphylococcus*. The work suggests that horn fly control could reduce the prevalence of mastitis in the animals. The first paper will be submitted to the Journal of Dairy Science and the second paper is in preparation.

**Nancy Hinkle** is working on a project to assess the genetics of cattle tolerance to horn flies. The results look promising, especially in light of related work that **Becky** is doing USDA-MARC. A long discussion followed about how breeding programs in the US have emphasized the production side of things, sometimes at the expense of tolerance to endo- and ectoparasites.

**Dana Nayduch** reviewed work done by **Jessica Thompson** on *Salmonella* transmission to food and among flies. The paper can be seen here: <https://doi.org/10.1089/fpd.2020.2818>. Flies that acquire bacteria by feeding on *Salmonella*-laced manure mostly eliminated the bacteria within 6 hours. Infected flies transmitted bacteria to cantaloupe, and uninfected flies could then acquire bacteria from the infected cantaloupe. Fly-to-fly transmission of bacteria was high in the presence of cantaloupe. The results indicate that *Salmonella* can replicate on cantaloupe.

End of discussion of project objectives.

**Mile Fletcher** presented a tribute to the late Craig Turner. Craig spent 39 years at VPI, trained 33 grad students, and published 103 papers. He did some of the early work on insecticide treated dust bags and backrubbers in the 1950s, and later published on a wide range of topics including *Culicoides*, face flies, horn flies, litter beetles, and the use of black dump flies for house fly management.

**Wes Watson** presented a tribute to the late Bob Pennington. Bob was a professional bull rider who served in the US Army in 1968-1970, then did his MS with Jack Lloyd in 1972. Bob had a long industry career that included work with Burroughs Wellcome, Coopers Animal Health and Pitman Moore before founding his own company, Ecto Development. Bob received the LIWC Lifetime Achievement Award for Industry in 2016 at the meeting in Boston.

**Becky** then led the project’s **business meeting**. Stillwater, OK was selected for the 2022 meeting site.

**Alec** **Gerry** and **Erika** led a discussion on the [www.VeterinaryEntomology.org](http://www.VeterinaryEntomology.org) website. How can we get better engagement? How can we get people to find the website and keep them there? Can we improve its findability on Google? Suggestions included that S1076 members put it on their own websites and include it in email signatures, in presentations, and in pest management Extension publications. Fresh and current information needs to be added to encourage people to come back to the site. This could include announcements of workshops and events such as information on commodity groups, veterinarians, and AAVP. Erika reviewed the assignments for Pest Bios and announced that a new section is under development on deer pests. The deer section will be assembled by **Justin Talley**, **Emily McDermott**, and **Laura Harmon**.

**Alec Gerry** reminded people to sign up as an expert for eXtension and to work on keeping the VetPextX database up to date. He suggested that we shoot for updating at the time of project re-write.

**Chris Geden** asked for a round of applause to recognize Becky Trout Fryxell for her leadership over the past three years.

Lastly, the meeting was then adjourned by **Becky Trout Fryxell**, who reminded the group that the project chair will now pass on to **Erika Machtinger**.

|  |
| --- |
| **usda LogoNational Institute of Food and Agriculture Update**  **S1076**  **January 5, 2021** |

1. **News and Personnel Updates (**[**https://nifa.usda.gov/newsroom**](https://nifa.usda.gov/newsroom)**)**
   1. NIFA relocated to Kansas City on September 30, 2019 and lost about 75% of its staff. NIFA now has over 200 employees and all mission critical functions have continued.
   2. On Jan 4, 2021 Dr. Carrie Castille was appointed as new NIFA director.  
      <https://www.usda.gov/media/press-releases/2020/12/22/usda-announces-dr-carrie-castille-new-nifa-director>
   3. Dr. Deb Hamernik rejoined NIFA on July 20, 2020 as Director, Division of Animal Systems and was appointed Deputy Director for the Institute of Food Production and Sustainability in November 2020. She previously served as Associate Vice Chancellor for Research (2018-2020) and Associate Dean of Research at the University of Nebraska-Lincoln (2009-2018). Previously she was National Program Leader with NIFA from 1997-2009.
   4. Dr. Timothy Sullivan is National Program Leader in the Division of Animal Systems (June 2020). He came from the Gloucester Marine Genomics Institute where his specialty was Animal Health and Aquaculture.
   5. Mr. Terry Radke joined NIFA as Program Specialist (April 26) and is currently working with 3 AFRI Programs.
   6. Dr. Amrit Bart joined NIFA on August 17 to work with NIFA Aquaculture and International Programs. Amrit is on sabbatical leave from the University of Georgia.
   7. Dr. Frank Siewerdt joined NIFA on October 25 as National Program Leader in Animal Genetics and Welfare. Frank comes to NIFA after 12 years in the poultry industry, the last five as senior director of genetics at Cobb-Vantress, having also held positions in academia and at the FAO.
   8. Dr. Kathe Bjork joined NIFA as National Program Leader in Animal Health on November 9. Kathe previously worked at APHIS as a veterinary medical officer (2008-2020) and antimicrobial resistance specialist (2015-2020).
   9. Cierrah Kassetas joined NIFA as Program Specialist on November 9. Cierrah has a MS in Reproductive Physiology from North Dakota State University and will work with several AFRI competitive grant programs.
   10. Danielle Farley joined NIFA as Program Specialist on November 23. Danielle has a M.A. in Communication Studies focused on Risk and Crisis Communication and Knowledge Management from the University of Montana.
2. **NIFA Budget**

The U.S. government is operating under a continuing resolution until December 11, 2020. (NIFA’s comparative budget table is not yet available, but when finalized will be posted at <https://nifa.usda.gov/budget>.)

1. **Competitive Programs**
   1. Three AFRI Requests for Applications (RFAs) have been or will be released for FY 2020, 2021, and 2022. See <https://nifa.usda.gov/afri-request-applications>.
   2. **Sustainable Agricultural Systems (RFA for FY 2020-2021 is pending and to be released Fall 2020).**
   3. **Education and Workforce Development (RFA for FY 2020 released July 16, 2020; RFA for FY 2021-2022 is pending and to be released Fall 2020, or early Winter 2021). Includes pre- and postdoctoral fellowships, undergraduate experiential learning, and K-14 educational programs).**
   4. **Foundational and Applied Sciences (RFA for FY 2021-2022 released July 17, 2020)**
      1. Animal Health and Production and Animal Products
      2. Crosscutting Programs
         * Critical Agricultural Research and Extension (CARE)
         * Data Science for Food and Agricultural System (DSFAS)
         * Inter-Disciplinary Engagement in Animal Systems (IDEAS)
         * Tactical Sciences for Agricultural Biosecurity
      3. Agricultural Innovation through Gene Editing has been sunset

B. Other competitive grant programs with opportunities for animal science research, extension and/or education

* 1. Organic Agriculture Research and Extension Initiative (OREI)
  2. Organic Transitions
  3. Beginning Farmers and Ranchers Program
  4. Biotechnology Risk Assessment Grants (BRAG)
  5. Special Research Grants Program - Aquaculture Research
  6. Small Business Innovation Research (SBIR); 8.3 Animal Production & Protection; 8.7 Aquaculture
  7. AFRI Small and Medium-Sized Farms (see Ag Economics & Rural Communities in AFRI Foundational RFA)
  8. AFRI Engineering Products and Processes (See Ag Systems & Technology in AFRI Foundational RFA)

1. Interagency Funding Opportunities
   * + 1. **Ecology and Evolution of Infectious Disease** – NIFA partners with the National Science Foundation (NSF), NIH and the U.K. Biotechnology and Biological Sciences Research Council. Applications are submitted to and reviewed at NSF with NIFA, NIH & U.K. participation. NIFA plans to invest $5 million in FY2021.
       2. A strategic planning workshop titled “**Future of Biomedical and Agricultural Research Programs Using Large Animals**” was hosted by Michigan State University and the University of Missouri on May 28 and 29, 2019 on the NIH campus. A workshop summary will be available soon.

D. Program outcomes for AFRI Foundational Programs in FY 2019. Program outcomes for FY 2020 are still pending because not all programs have completed panels yet or announced funding decisions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Animal Health and Production and Animal Products ($44.2 million total program funds)** | | | | |
| **Program Area** | **Program Contacts**1 | **Funding**  **($ million)**2 | **# Standard Awards**3 | **Success Rate** |
| Animal Breeding, Genetics, and Genomics | Lakshmi Kumar Matukumalli | $4.7 | 9 | 39% |
| Animal Reproduction | [Mark Mirando](http://www.nifa.usda.gov/about/AllUnits/staff_view.cfm?record_id=67&CFID=9422194&CFTOKEN=71717749) | $6.4 | 13 | 25% |
| Animal Health and Disease | Tim Sullivan  & Kathe Bjork | $14.7 | 28 | 26% |
| Animal Nutrition, Growth, and Lactation | [Steve Smith](http://nifa.usda.gov/about/AllUnits/staff_view.cfm?record_id=4102) | $9.8 | 18 | 31% |
| Animal Well-Being | [Mark](http://www.nifa.usda.gov/about/AllUnits/staff_view.cfm?record_id=73&CFID=9422194&CFTOKEN=71717749) Mirando  & Frank Siewerdt | $3.3 | 6 | 24% |
| Inter-Disciplinary Engagement in Animal Systems (IDEAS)4 | [Mark](http://www.nifa.usda.gov/about/AllUnits/staff_view.cfm?record_id=73&CFID=9422194&CFTOKEN=71717749) Mirando | $4.1 | 4 | 22% |

1 Some program contacts will change in the future as new National Program Leaders are hired at NIFA.

2 Excludes contributions to AFRI cross-cutting programs in Gene Editing and Tactical Science for Biosecurity.

3 Budgets ≤ $500,000 (incl. indirect costs) for up to 5 yrs; exc. seed, sabbatical, equipment & conference awards.

4 Includes $2 million contributions from other AFRI Program Areas (BNRE, AERC, AST).

1. **Contact Information for the Division of Animal Systems**

*National Program Leaders*

Debora Hamernik Deputy Director, IFPS (816) 868-8664 debora.hamernik@usda.gov

Amrit Bart Aquaculture & International TBD amrit.bart@usda.gov

(on sabbatical with NIFA)

Kathe Bjork Animal Production Systems TBD kathe.e.bjork@usda.gov

Lakshmi Matukumalli Animal Genomics (816) 926-1189 lakshmi.matukumalli@usda.gov

Bob Smith Veterinary Medicine (816) 926-2833 robert.m.smith@usda.gov

Steve Smith Animal Production Systems (202) 445-5480 steven.i.smith@usda.gov

Timothy Sullivan Animal Health TBD timothy.sullivan@usda.gov

Frank Siewerdt Animal Welfare and Genetics TBD frank.siewerdt@usda.gov

*National Science Liaison*

Mark Mirando Animal Production Systems (202) 445-5575 mark.mirando@usda.gov

*National Science Liaison Team Program Specialists*

Olivia Kwong AFRI (202) 720-7536 olivia.kwong@usda.gov

Davida Tengey Animal Systems (202) 690-8629 davida.tengey@usda.gov

*Program Specialist*

Cierrah Kassetas Animal Production Systems TBD cierrah.kassetas@usda.gov

Terry Radke Animal Production Systems (816) 926-2667 terry.radke@usda.gov

Danielle Farley Animal Production Systems TBD Danielle.farley@usda.gov

*Program Coordinator*

Marline Azevedo Animal Protection/Agrosecurity (816) 926-3478 marline.azevedo@usda.gov

**S1076 Website Committee Report**

**January 2021**

**Website Committee:**

1. Erika Machtinger
2. Becky Trout Fryxell
3. Brandon Smythe
4. Pia Olafson
5. Phil Kaufman
6. Amy Murillo
7. Dave Taylor
8. Kateryn Rochon
9. Alec Gerry
10. Luisa Domingues
11. **Analytics breakdown for November 2020**
    1. **Overall Audience**
       1. During this period we had 601 users in 748 sessions.
       2. 10% of users are returning user
       3. The average session duration was 1 minute and 28 second
       4. 82% bounce rate
    2. **User location**
       1. Top user country was U.S., followed by Australia, UK, then Canada.
    3. **Acquisition**
       1. 76% of visitors reached the site based on organic searches on websites like Google, Bing, and DuckDuckGo
       2. 20% of users went directly to the site (this means they typed the URL into their address bar, or Google Analytics couldn’t specifically determine the acquisition method)
       3. Engagement from social media and referrals were comparably small
    4. **Site Use**
       1. Sticktight fleas are the most visited page on the site.
       2. All of the most popular pages (except for the main page) are write-ups.
       3. People starting at the main page tend to move on to the Dairy Cattle page or the Vet Pest X page
12. **Website updates and maintenance**
    1. [Primary and secondary contact for each main webpage](https://docs.google.com/spreadsheets/d/1d44x06_MqhyAZ4_hDosKm0EM_fZYxy3AWPY53mXzj-M/edit#gid=0)
    2. Two weeks each year, prior or during S1076 update week and mid-way through the calendar year notices will be sent to the group for updates to any part of the website.
    3. “[How to” guides completed](https://drive.google.com/drive/folders/1y9GzXj_4YGJgh7QTM48W73HbVHV7uzb6?usp=sharing)
    4. Website needs
       1. Pest Bios Needed:
          1. Black Fly - Chris G.
          2. Face Fly - DONE
          3. Deer Fly - Sonja
          4. Black Garbage Fly - Chris G.
          5. Horse Botfly - Dave T.
          6. Sheep Ked - Kateryn
          7. Sheep Louse - Wes
          8. Hog Louse - Wes
          9. Fowl Tick - Amy
          10. American Dog Tick - Alec
          11. Mange Mite - Hannah
          12. Sand fly - Zain
       2. Images Needed:
          1. Sheep Louse -Alec
          2. Sheep Ked
          3. Wool Maggot - Aaron?? Wes??
          4. Eye Gnat - Lyle (Erika will find)
13. **Improving Engagement**
    1. Website committee will discuss page leaders adding “highlights” of major research to each animal section that is updated at lead bi-annually and is of particular interest or impact (e.g., Tabanids and zebra stripes)
    2. Discussion with S1076 members
       1. Committee is dynamic and new committee members are encouraged
       2. Coordinating with [commodity groups](https://www.veterinaryentomology.org/commodity-groups) (e.g., AAEP, US Poultry & Egg) to promote veterinaryentomology.org in resources, newsletters, etc.
       3. Members with an Extension appointment may consider adding Veterinaryentomology.org to Extension products
       4. Connecting with the National eXtension [Ask an Expert](https://ask.extension.org/ask) and removing our specific Q & A capacity.
       5. Reminder to include #Vetento in tweets, and to include Veterinaryentomology.org into email signatures, presentations, Extension products, etc.