

FLYNEXX® (Cyromazine):

Integrated Fly Control at an Eastern Corn Belt Swine Finishing Unit

Dr. Tom Gillespie, DVM

University of Purdue; Diplomate,
ABVP Swine Health Management Specialty

Kevin C. Thorne

B.A. DePaul University (case manager)

Abstract

A study was conducted in the Eastern Corn Belt, to evaluate the efficacy and convenience in applying Flynexx® (Cyromazine) using the 1-2-3 PIT Applicator, within a swine finishing unit. In addition, oral fluids collected from ropes, plus adult flies collected were tested for bacteria and viruses. The site consisted of eight finishing rooms housing 1070 head per room. Room #1 was unpopulated, and was not treated. This room was intentionally left empty and untreated, allowing for repairs, cleaning and disinfecting prior to loading nursery animals. All other rooms housed animals for the duration of the study. Room #2 was completely treated using the 1-2-3 PIT Applicator to apply Flynexx. Room #4 was partially treated (approximately 1/3 of the room) with Flynexx also using the 1-2-3 PIT Applicator. All other populated finishing rooms were left as untreated controls. Applications were completed by Kevin Thorne and Dr. Tom Gillespie on May 23, 2017. The goal of the applications were to demonstrate significant reduction of adult fly population via the use of the IGR (insect growth regulator), Flynexx® (Cyromazine) larvacidal granules. Fly burdens were assessed on two dates; May 22 and May 30. A pre-application date (May 22) was chosen to obtain a baseline when no products were in use. Initial trap counts, and follow-up counts on May 30, were used to check the efficacy of Flynexx. The fully treated room, #2 showed a significant decrease in adult fly counts of 54.2%. The partially treated room, #4, showed a minimal increase of 3.4%. All untreated control rooms had substantial increases in fly counts, ranging from increases of 50% to 2,036%, of which the highest increase was for the initially unpopulated room #1.

Current farm management protocol is to monitor the site monthly using oral fluid samples and serology for the presence of PRRSV, *Mycoplasma hyopneumoniae* and IAV. At the time this site was selected for evaluation, there were no clinical signs of major pathogen activity, although testing of the adult flies did indicate the presence of bacteria. It is not certain at this point if houseflies can actually transmit swine pathogens between commercial pig farms, however several studies have shown that they can serve as mechanical vectors of several swine pathogens under experimental conditions. (Otake et al. 2003)



Introduction

Current approaches in fly control within the farm animal business are varied and are based on personal decision according to successes and failures, as well as recommendations of managers, veterinarians, and pest control experts. There has been much improvement in pest management methodology over earlier strips, traps, and chemicals, to now include adulticides, predators (i.e. beetles), insect growth inhibitors, insect growth regulators, as well as other methods. Most experts now agree that an integrated pest management approach is the key to fly control (Westenbroek, 2008). These methods may include some or all the above, as well as improved sanitation, and improved facility management methods and processes.

Fly problems are much more than a nuisance. Farmers are keenly aware of the negative impact flies can create on the growth and performance of farm animals, which may lead to reductions in production and potentially serious economic losses (Stork, 1979). Whenever fly populations become extreme in locations close to human habitation, they can pose health and environmental risk hazards and may become an inconvenience to neighbors and their communities. This may lead to issues, up to and including closure, by local, state and federal governing bodies (Axtell, 1986). Flies are also known as carriers of many diseases including *Chlamydia trachomatis*, mastitis, mycobacterial infections and parasitic helminthes such as *Parafilaria bovicola*, *Thelazia* spp., *Heterotylenchus automnalis* and the eggs of *Ascaris*, *Trichuris*, and *Ancylostoma* (Axtell, 1986). It should also be noted that flies do indeed create a nuisance within the production animals sector, which can in turn lead to slower growth rates and reduced production, both which are of significant financial concerns to the producer. (Sanchez-Arroyo, Capinera 1998)

In these times of extremely close net financial profitability for producers, processes and protocols for fly control is now more key than ever considering the emphasis on margins, fluctuating fuel costs, and varying feed outlay due to market prices of corn and soybeans.

The product used in this study is Flynexx (Cyromazine), a larvicidal insect growth regulator from Piedmont Animal Health. The formulation is designed for use across an array of facilities and scenarios, applied as either a granulated crystal or mixed with water to be used as a spray. Generally, if the organic material is damp or wet, a scatter is preferred at one cup per 200 square feet. However, if the organic material is dry, a spray is recommended. In this study, Flynexx was used as a spray at the labeled rate (one pound per 200 square feet) and applied through the 1-2-3 PIT Applicator, which is specifically designed to apply products evenly across the pit with minimal time and effort.

Facilities

The facilities for this study were chosen by request from the veterinarian of responsibility, Dr. Tom Gillespie, and assisted by Kevin C. Thorne, Director, Sales and Marketing, Piedmont Animal Health.

Upon visitation of the facilities, the decision of which finishing barns to conduct the study within the facility were selected for the following reasons:

1. Manure handling was all-in / all-out by room, via pull-plug to the lagoon. No pumping of the pits were done during the life of the study.
2. Animals housed in each room would be consistent due to rooms being filled from the adjoining nursery.
3. Fly burdens were extremely heavy. Many different life cycles were observed, from larval to pupae, to a high and aggressive burden of adult flies.
4. Both treated barns were typical swine finishing units featuring tunnel ventilation, with end curtains and fans, and with normal exposure to the temperature and humidity changes from the exterior.

The temperature during the length of the study ranged from highs of 63-81 degrees F, with lows ranging from 48-61 degrees F. These are normal seasonal ranges for the production site. Rain total for the length of the study was approximately 1", which is within normal geographical parameters. The facility is typical of swine facilities, with slightly over 8,000 square feet housing 1070 head in each room. Each barn consisted of two rooms divided by a solid wall. Pits were also separated between rooms. Flooring is typical concrete slats and the barn is of metal construction. The manure system is deep pit with a pull plug design to empty into the lagoon. All the rooms feature center walkways. Every room exhibited heavy to extremely high fly burdens, along with extremely high levels of house fly larvae in the pits.

Trapping

All barns were set with one Raid® Jumbo fly trap, commercially available at major farm retail stores. Three additional traps were evenly dispersed in the hallways. In each treated barn, one trap was placed in a central location within the barn, along the walkway, and within two feet of the slats. The locations were chosen based on availability, lack of interference with animals and employees, access to organic material, and observed adult fly density. These particular traps were selected due to their non-insecticidal design, and ease of deployment. During the study, each location deployed new traps, with all traps identified by barn type, date set, date retrieved, and location of trap. All traps were left for 68 hours for each trapping, and fly counts were documented and charted in the accompanying graphs.

Applications and Collections

The applications were per label instructions as described earlier, with special notation that Flynexx was used strictly as a spray under the slats, within the pens and in the walkway. Flynexx was used at, one pound, for each gallon of water, for every 200 square feet per label application. No other fly control products were used. The timing for data collection of the above described traps was scheduled to obtain a baseline pre-application count, and also a count seven days following first application. The above trapping schedules were followed until conclusion of the study. The collection of each trapping at 68 hours was done to provide uniformity in the study.

All barn traps were, labeled, dated, and identified by a unique number or letter based on the barn, and set in the same location to follow trends and monitor findings. All barn traps were set and collected during the same time frame. Counting of the flies in the traps was done following collection from the facilities.

The following schedule identifies the trap settings, application dates, and pre and post trap collection counts.

- 05-19-17 Traps set, first setting
- 05-22-17 Traps collected and counted, first counts
- 05-23-17 Application of Flynexx
- 05-27-17 Traps set, second setting
- 05-30-17 Traps collected and counted

Evaluations

Counts were done on each trap with final counts documented on a master data collection sheet, and transferred onto an Excel spreadsheet and graphed for final analysis.

All non-insecticidal traps were set and retrieved by the above schedule to evaluate the larvicide effectiveness post application. Visible observation pre-treatment indicated an overwhelming number of adult flies, larvae and pupae. Fly species identified were *Musca domestica Linneaus* and *Fannia canicularis*, the common house fly and lesser common house fly.

Data Analysis

Fly populations, as determined by trappings, were charted and graphed by trap, facility and cumulative counts of both barns. The accompanying graphs document the trap findings. Evaluations and mathematical elimination reductions were calculated by first trapping count (**X**) minus last trapping count (**Y**) divided by first trapping count (**X**), times, 100.

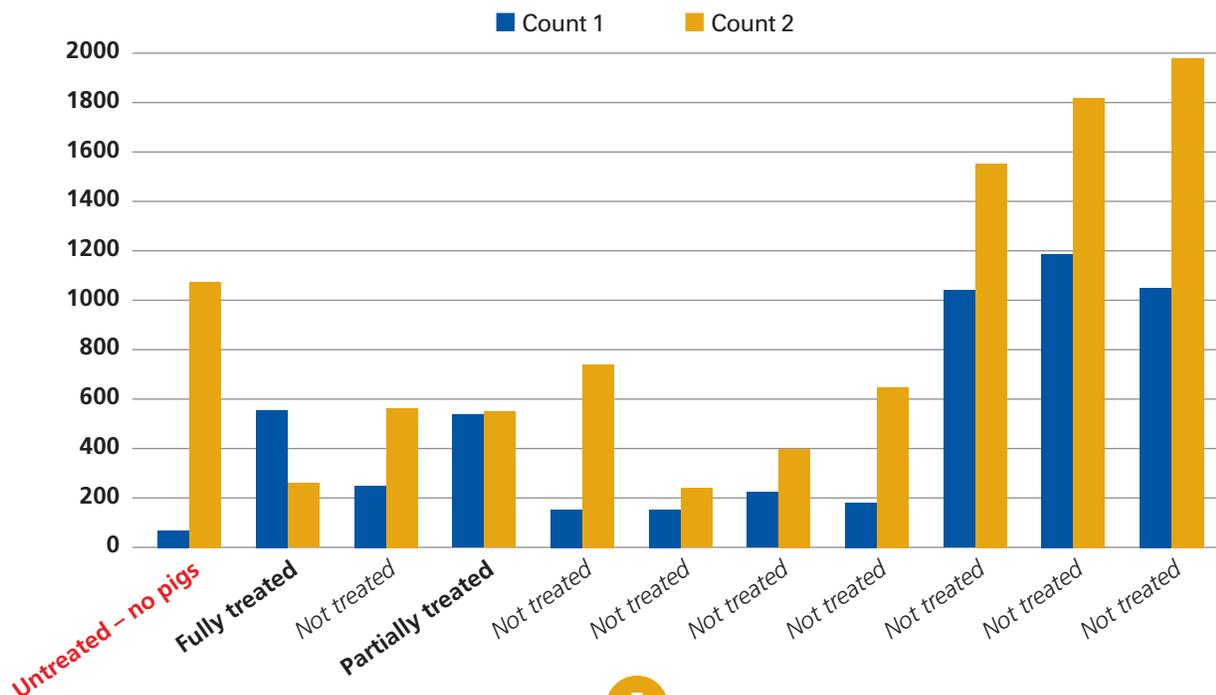
$$\text{Percentage Reduction} = \frac{X - Y}{X} \times 100$$

Results

All trapping sites (one in each room and in three spots in the hallways) were monitored and evaluated until study conclusion. The only reduction was in room #2, the room that was fully treated with Flynexx. The partially treated room, #4, had a nominal increase of 3.4%. All other rooms showed increases ranging from 50% to 2,036%. The highest increase recorded was in room #1, which was unpopulated at the first counting and was subsequently repopulated with new pigs from the nursery before the second counts were made. This observation is a significant key finding given the extensive clean up done in room #1, prior to re-population. The data illustrates a rapid onset of fly activity and heavy fly burdens within a short period of time after introducing new populations into a “clean room”. There is evidence to indicate that room #1, when re-populated and despite proper management procedures, quickly sustained high fly infestations due to the activation of key trigger elements (heat, carbon dioxide, manure accumulation in pits), within that grower finisher room.

FLYNEXX with 1-2-3 PIT Applicator Pig Trial

TREATMENT	LOCATION	COUNT 1	COUNT 2	COUNT +/-	% CHANGE
Untreated – no pigs	Room 1	50	1068	1018	2036%
Fully treated	Room 2	548	251	-297	-54.2%
<i>Not treated</i>	<i>Room 3</i>	<i>248</i>	<i>556</i>	<i>308</i>	<i>124.2%</i>
Partially treated	Room 4	533	551	18	3.4%
<i>Not treated</i>	<i>Room 5</i>	<i>146</i>	<i>735</i>	<i>589</i>	<i>403.4%</i>
<i>Not treated</i>	<i>Room 6</i>	<i>148</i>	<i>234</i>	<i>86</i>	<i>58.1%</i>
<i>Not treated</i>	<i>Room 7</i>	<i>217</i>	<i>389</i>	<i>172</i>	<i>79.3%</i>
<i>Not treated</i>	<i>Room 8</i>	<i>177</i>	<i>648</i>	<i>471</i>	<i>266.1%</i>
<i>Not treated</i>	<i>Hallway 1</i>	<i>1026</i>	<i>1539</i>	<i>513</i>	<i>50.0%</i>
<i>Not treated</i>	<i>Hallway 2</i>	<i>1178</i>	<i>1811</i>	<i>633</i>	<i>53.7%</i>
<i>Not treated</i>	<i>Hallway 3</i>	<i>1045</i>	<i>1972</i>	<i>927</i>	<i>88.7%</i>



Discussion

This site is monitored monthly by using both oral fluid samples collected at one rope sample per 500 head of animals and serum from ten randomly selected animals (out of two rooms) for a total of 20 samples. If clinical signs occur between monthly monitoring, additional samples will be taken. In regards to the virus results, PRRSV and Influenza type A virus swine (IAV-S) were not detected. It was not expected to find either viral pathogen. In addition *Mycoplasma hyopneumoniae* is also monitored as a bacterial pathogen. Likewise, no positive diagnostic evidence was found for this pathogen.

Minor species of bacteria were cultured from the flies that were submitted. The types of bacteria cultured most likely reflect what is in the environment of the room and pits. Bacterial isolates were not tested for potential disease causing properties; however a surprise in the amount of bacteria was cited by the bacteriologist on the case.

Bacteriology Culture Summary

LOCATION	ORGANISM	GROWTH	ORGANISM	GROWTH
Hallway 1	Serratia species	Moderate	Pseudomonas species	Moderate
Hallway 2	Citrobacter species	Moderate	Aeromonas species	Moderate
Hallway 3	Morganella species	Moderate	Gram negative non fermenter	Moderate
Room 1	Gram negative non fermenter	Low	Gram negative non fermenter	Low
Room 2	Gram negative non fermenter	Moderate	Gram negative non fermenter	Moderate
Room 3	Gram negative non fermenter	Moderate	Gram negative non fermenter	Moderate
Room 4	Proteus species	Moderate	Gram negative non fermenter	Moderate
Room 5*	Proteus species	Low	Gram negative non fermenter	Low
Room 6	Gram negative non fermenter	Moderate		
Room 7	Gram negative non fermenter	Few		
Room 8	Gram negative non fermenter	Moderate		

*Room 5 also noted a few cells with *Escherichia coli* haemolytic

Upon examination and understanding of the fly life cycle, it is important to know, only 15-20% of a fly population exists as adult flies at any one time (Novartis, 2008). Historic treatments that focus solely on the elimination and/or reduction of the adults in a population is generally not an effective way to eliminate the population. Additionally, total reliance on insecticide applications in and around the house often results in failure to produce long-term control results (Ellis, 2002). Continual use of adulticides alone not only give credence to resistance theories, but can also leave the producer and manager frustrated and ever searching for newer and better adulticides. This is evidenced by the increases in the hallways where adulticide baits were in use in bait trays, yet fly counts increased in each case. The exception was with the totally treated Flynexx room, supporting the need for the use of IGR's/larvicides. These results along with the specific observation uncovered at the end of the study in room #1, merits a discussion regarding a change in processes and protocols in conjunction with "turns" based on the highest population increase in the untreated barn.

Conclusion

The testing of the bacterial and viral counts is conclusive enough to tell us that adult flies provide a method of transmission of bacterial pathogens throughout a room. House fly control is necessary to reduce the transmission of bacteria within a room to animals and humans. Using Flynexx as an IGR is an effective method of reducing and breaking the house fly life cycle, and thus population burdens within a swine operation. Although application in this study was limited to two rooms, with several untreated control rooms, the location and finishing production similarity of this site to the industry standards gives credence to this study based on year around fly burden, facility climate, and processes and protocols. The conclusion of this study is that flies are indeed carriers of multiple species of bacteria which can have negative consequences for producers.

Whereas the average room (excluding hallways) almost doubled their fly populations (186% increase) over the testing period the totally treated Flynexx room reduced the adult fly population by a statistically significant 54.2%.

The rapid and massive increase of flies in room #1 after repopulation shows us that the application of Flynexx would be valuable in managing fly control populations during the turn and reducing the fly pressure as new pigs are introduced to this room.

The use of Flynexx, applied through the 1-2-3 Pit Applicator, is recommended as the foundation of any fly control program in a swine finishing facility where pigs are located on slats with manure pits located below the pigs. Application when houses are emptied, and during each turn, is the most convenient and effective time to reduce fly populations.

References

Axtell, R.C. 1986. Fly control in confined livestock and poultry production. Novartis Animal Health, Basil, Switzerland.

Ellis, R. 2002. Mosquito and fly prevention and control on Manitoba farms.

Novartis, 2008. Anti fly program, an integrated approach. Retrieved from www.flycontrol.novartis.com/antifly/en/index.shtml. October 17, 2008.

Stork, M.G. 1979. The epidemiological and economic importance of fly infestation of meat and milk producing animal in Europe. *Vet.Rec.*, v. 105, p. 341-343.

Westenbroek. 2008. Integrated Pest Management for Fly Control in Maine Dairy Barns.

Satoshi Otake, Scott A. Dee, Roger D. Moon, Kurt D. Rossow, Carlos Trincado, MacDonald Farnham, Carlos Pijoan. Survival of porcine reproductive and respiratory syndrome virus in houseflies. *The Canadian Journal of Veterinary Research*, 2003; 67:198-203.

Satoshi Otake, Scott A. Dee, Roger D. Moon, Kurt D. Rossow, Carlos Trincado, Carlos Pijoan. Evaluation of mosquitoes, *Aedes vexans*, as biological vectors of porcine reproductive and respiratory syndrome virus. *The Canadian Journal of Veterinary Research*, 2003; 67:265-270.

Hussein Sanchez-Arroyo and John L. Capinera, August 1998, revision April 2017. *Featured Creatures – The house fly, Musca domestica Linnaeus*. University of Florida. Publication # EENY-48.

RAID® is a trademark and brand of S. C. JOHNSON & SON, INC.