Assay for Detecting Ractopamine in Pig Hair

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Situation Statement

Ractopamine is a feed additive used in the U.S. for 25 years to promote lean muscle growth and feed efficiency in both commercial and show pigs. Responding to global export market demands for Ractopamine-free pork, many large meat packers in the U.S. quit purchasing pigs fed ractopamine in late 2019. In response to this, many county fairs in MI restricted use of Ractopamine in show pigs in 2020 and 2021; that practice will continue in 2022. Fairs are weary of implementing rules that cannot be enforced, and therefore were looking for options to test pigs for the presence of Ractopamine to enforce restrictions that were put in place. MSU Extension's Pork Team worked with colleagues in the Children and Youth Institute to provide education to fair organizers on this market demand change, offered Ractopamine testing options and provided educational opportunities. When no suitable commercially available assay was identified, the team worked with the MSU Veterinary Diagnostic Laboratory to develop a non-invasive assay that measures Ractopamine in pig hair that meets the needs of show pig owners, county fairs and could also be used by packers and markets who need to confirm Ractopamine-free status in pigs they purchase.

Educational Outreach

The primary focus of the MSU Extension pork team was assisting fairs and exhibitions with understanding the changes to market demand and how that affected their ability to market animals for their exhibitors. The pork team provided consultations with fairs and exhibitions to assist them with restructuring their rules and market connections. They also provided educational opportunities for those involved in exhibition so that they understood how to adjust to market demands and packer requirements and the safety of ractopamine products. Additional resources were developed to expand the reach of this message, including informational documents, social media posts, PowerPoint presentations and informational articles for written and on-line medias.

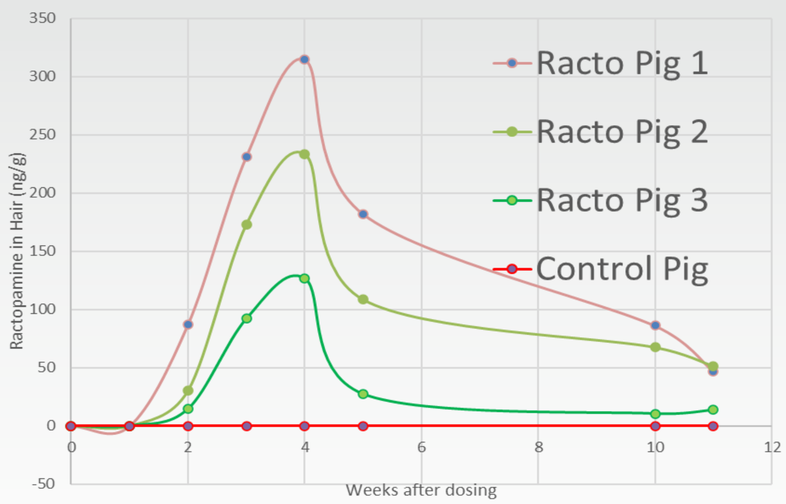
Communications with fairs and exhibitions prioritized a need for a cost-effective, timely testing option that would allow organizations to validate that the animals exhibited at their event were ractopamine free. To meet this need the MSU Extension pork team partnered with the MSU Swine Teaching and Research Facility and the MSU Veterinary Diagnostic Laboratory (VDL) to develop a non-invasive assay that detects the use of Ractopamine in pigs if feed any time during the finishing period (12 weeks) prior to market. This led to more educational outreach efforts to provide MI show pig owners and fair organizers information on options for validating non-Ractopamine use.

Needs Assessment

Informational meetings were held throughout MI in 2020 to explain the implications of Ractopamine-free requirements and to learn about what would be needed in an assay to support the show pig industry. Our evaluation of available commercial assays revealed none could detect Ractopamine used during the period 1-3 months before fair and all of the current options were very costly. Working in collaboration with MSU Animal Science Department, the Swine Teaching and Research Facility and MSU Veterinary Diagnostic Laboratory, an experiment was conducted in pigs, using hair samples collected over a 3 month period following in-feed dosing at 12 mg/kg (feed).

Research Methods

- Commercial (PIC) barrow pigs weighing 175 lbs were housed in individual pens at MSU Swine Research facility. Pigs were fed age-appropriate diet alone (control group, n=3) or formulated with 12 mg/kg Rac (treated group, n=3) for 4 weeks.
- 0.5 g hair samples were collected from the back region, approximately weekly beginning 2 weeks before treatment started and ending 12 weeks after Rac feeding ended.
- Pig hair samples were assayed by LC/MS/MS methods. This assay is sensitive to <0.1 ppb, and reliably detected Rac in hair samples collected during a 12+ week period after Rac feeding ended.



Pig surface (left) after several 0.5 g hair samples (right) collected for testing. Lower plot shows appearance of Rac in pig hair, based on LC/MS/MS assay, over a 12 week period when pigs were fed during the first 4 weeks with Rac at 12 mg/kg.

Outcomes and Impact

There were a number of outcomes from of this project, which was necessitated by a sudden policy shift among U.S. pork packers in late 2019. They include:

- Development by MSU Extension educators and campus-based specialists of educational programming.
- Availability of a new assay for Ractopamine testing in the MSU Veterinary Diagnostic Laboratory platform that support the MI show pig and commercial pork industries.
- The assay developed meets all key criteria for MI fairs, including low cost ($25/sample), non-invasive and easy to perform at the animal level, short turnaround, and won't require secondary testing to confirm true actives or eliminate false negatives; the LC/MS/MS assay is absolutely definitive for Ractopamine, and is sensitive to 0.1 ppb.
- An update on the new assay was reported to fair organizers and show pig leaders at the Michigan Association of Fairs and Exhibitions conference in January, and to the Michigan Pork Producers Association.
- Creations of educational outreach materials including: facts sheets, social media information and supporting articles previously published by MSU Extension.