Pig Development Department

Teagasc Pig Research Dissemination Day 2019

Teagasc Pig Development Department

April 30th: Horse & Jockey Hotel, Co. Tipperary
May 1st: Cavan Crystal Hotel, Co. Cavan

Teagasc
Agriculture and Food Development Authority

Teagasc Pig Research Dissemination Day 2019

Teagasc Pig Development Department

Tuesday April 30th: Horse & Jockey Hotel, Co. Tipperary

Wednesday April 1st: Cavan Crystal Hotel, Co. Cavan

Agriculture and Food Development Authority

Ongoing Research

ENTAIL: Strategies to control tail biting in pigs on fully-slatted floor

J.-Y. Chou[1,2,3], D. A. Sandercock[2,3], R. B. D'Eath[2,3], and K. O'Driscoll[1]

[1]Pig Development Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork; [2]SRUC, Roslin Institute Building, Edinburgh, UK; [3]The University of Edinburgh, UK

EU Council Directive (*2008/120/EC*) prohibits the routine practice of tail docking to control tail biting in pigs. The ENTAIL project aimed to find strategies to control tail biting on fully slatted floors, using enrichment and dietary fibre.

The first task focused on finding suitable materials. We compared different wood types (*beech, larch, spruce and Scots pine*) and an Easyfix® rubber floor toy. Pigs interacted with the spruce most frequently in two experiments and the rubber floor toy generated a similar amount of interaction as the spruce post. No carcass damage was found due to using wood.

In the next experiment we attempted to rear undocked pigs by using one of two enrichment items (*1 per 14 pigs*) and varying the fibre level in the diet. The pigs had either: a high or standard fibre diet; a spruce post or a rubber floor toy as enrichment in the weaner stage; the same/or the other type of enrichment in the finisher stage. There were many tail biting outbreaks, and a substantial number of pigs were removed temporarily from their home pens due to tail biting. Pigs fed with a high fibre diet had slightly worse tail damage and performed more tail biting. Pigs which had the floor toy in the weaner stage and wood in the finisher stage had lower tail lesion scores. Pigs which had the floor toy interacted with the enrichment more frequently overall. This study showed that higher fibre in the diet in a relatively barren environment did not help reduce tail biting or tail lesions.

Next, we conducted a pilot study to find out if it is possible to rear undocked pigs with a manageable level of tail biting in a fully slatted system. We provided the pigs with enrichment in the farrowing pen and eight enrichment items, with a lower stocking density (*12 pigs/pen*), post-weaning. We also tested the effect of switching the enrichment provided every two weeks. No tail biting outbreak occurred, and only one out of 96 pigs had a severely bitten tail. Pigs interacted with a rack of loose material most frequently, and the overall level of interaction with enrichment did not decline over time.

In the last experiment, we again reared undocked pigs, and compared an enriched/barren environment in the farrowing house, and three enrichment management strategies post-weaning, based on the frequency of replenishment (*"Reduced": on Monday/Wednesday/Friday; "Medium": once daily; "Optimal": ad-lib*). All pens received the same enrichment (*8 items/pen, including an elevated rack supplied with fresh-cut grass*). The ADG in the finishing stage was higher in Optimal than Reduced pigs. Reduced pigs also performed more damaging behaviours than Optimal and Medium pigs however no difference in lesion scores was found between treatments.

Although sporadic tail biting outbreaks occurred (*n = 14, halved compared to the previous trial*), they usually resolved within two weeks, and all but one tail-injured pig were successfully reintroduced back to their home pens after removal.

Take home messages:

- The quality and quantity of enrichment is important for it to be effective, and different items are suitable for pigs at different ages.
- Simply altering the fibre level in pigs' diet without suitable enrichment provision is not enough to control tail biting in undocked pigs on fully slatted floors.
- Increased data collection is important to deal with tail biting outbreaks, observe early warning signs of tail biting, and keep a good record of tail biting incidents. Removed pigs can be successfully reintroduced with a good record-keeping protocol.

Notes:

PigNoDock: Development and implementation of a tail biting risk assessment tool on commercial pig farms

K. O'Driscoll

Pig Development Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork;

Routine docking of pigs' tails is not permitted as a method of controlling tail biting without exhausting other options first (*2008/120/EC*). Recently there has been an increased focus on this legislation at both EU and national level, with the aim of improving compliance. DG Sante are mid-way through a three year project investigating levels of compliance and enforcement across all EU countries, with the ultimate aim to ensure that the law is applied consistently. As part of this, National action plans (*NAPs*) were required to be submitted by the regulatory Authorities in each Member State (*MS*) by the end of December last year. Information on how each MS will carry out risk assessment on farm was required.

For the past four years, targeted research at Moorepark has investigated enrichment materials and diets to reduce tail-biting in docked and undocked pigs. The next step is to bring research to commercial units, to develop a tail-biting risk reduction system that is practical and effective for producers to use. Although we identified enrichment materials which are favourable to the pig, control of tail biting in undocked pigs using only enrichment in addition to routine management in the Moorepark pig unit proved extremely difficult, and at a rate of use that is unfeasible on commercial units. It is evident that other factors, such as stocking density, feeding method and formulation, pen design etc., also play large roles in reducing the risk of biting. Due to the multi-factorial nature of tail-biting, the effectiveness of adjusting these parameters can only be evaluated in commercial units. It is likely that parameters that need to be adjusted will be specific to individual units.

This project will run from January 2019 to December 2023, and incorporate a PhD studentship. The first task is to develop a provisional tail biting risk assessment protocol, which we are carrying out in tandem with AHI and the Department of Agriculture. Training will be provided to PVPs as to its use on commercial units, and it's effectiveness at identifying risks associated with tail lesions and biting outbreaks assessed by Teagasc personnel. The PhD studentship will focus on adapting a more robust tail biting risk assessment protocol previously developed in Germany (*SchwIP*), to Irish systems. This will be carried out in collaboration with Dr. Sabine Dippel, who was the project manager during its initial development. The work will involve using workshops and training seminars to support modification and implementation of the protocol, through co-design with stakeholders in the Irish pig industry. We are then hoping to implement the system on a number of commercial units, and assess the effectiveness of any changes implemented by producers. We will also implement the SchwIP protocol

in the Moorepark unit, and continuously feed-back to producers on our progress.

This detailed auditing of infrastructure, management, and use of animal based measures, will identify risk-factors on individual farms, and inform guidelines for best-practice when rearing undocked pigs. Additionally, development of a risk-assessment protocol will assist producers in switching to not docking their pigs while minimizing any negative impacts on the pigs or their business.

Notes:

Optipig: Optimising annual sow output by increasing the number of viable piglets born alive and reducing pre-weaning mortality through nutritional management of the sow

H.B. Rooney[1,2], K. O'Driscoll[1], J.V. O'Doherty[2], P.G. Lawlor[1]

1Pig Development Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork; 2University College Dublin, Belfield, Dublin

Since the late 1990's, intense genetic selection for increased sow prolificacy has resulted in an increase in litter size at birth. On Irish commercial herds, the number of piglets born alive per litter has increased from 10.8 in 2000 to 13.5 in 2017. This increase in litter size is correlated with a reduction in piglet birth-weight and vitality, and increased piglet mortality. However, targeted sow nutritional strategies to increase piglet birth-weight and lifetime growth may help to negate the negative consequences that producers are currently facing with larger litters.

In 2016 and 2017, two studies were conducted with 84 gilts and 66 sows, respectively, to assess the effects of sugar beet pulp (*SBP*) inclusion and dietary L-carnitine (*CAR*) supplementation. The aim of these studies was to increase voluntary lactation feed intake in gilts by feeding a 40% SBP diet in gestation; and to increase birth-weight and subsequently, lifetime growth in piglets through maternal dietary CAR supplementation during gestation (*0.125g/d*) and lactation (*0.250g/d*). A third study was conducted in 2018 to investigate the effect of increasing the energy density of sow lactation diets using 100 multiparous sows. The energy densities of the diets were 13.8, 14.5, 15.2 and 15.9 MJ DE/kg. We hypothesised that sow energy intake and the survival and growth of piglets would increase in response to increased energy density in the diet.

Results from the first two studies showed that CAR supplementation during gestation increased the total number of piglets born (*+1.6 piglets*), without negatively affecting piglet birth-weight. Furthermore, pigs from CAR supplemented gilts and sows had a heavier carcass weight with increased lean meat %. Feeding a high SBP diet during gestation softened the faeces of gilts around farrowing, which is beneficial in reducing constipation. In the third study, sows fed the 15.9 MJ DE/kg lactation diet had a higher energy intake and their piglets had increased vitality at 24 hours after farrowing. However, sows fed the 15.2 MJ DE/kg lactation diet weaned a higher number of piglets. Sows fed the lowest energy density diet (*13.8 MJ DE/kg*) weaned the heaviest litters.

Take home messages:

- Feeding CAR during gestation is a viable, on-farm strategy for increasing the total number of piglets born, but does not influence individual piglet birth-weight.
- CAR supplementation to gilts and sows increased carcass weight and lean meat % at slaughter in their progeny.
- Feeding a high SBP diet in gestation did not increase lactation feed intake, but improved gilt faecal consistency around farrowing which can reduce constipation.
- A lactation diet high in energy (*15.2 MJ DE/kg*) increased the number of piglets weaned per litter.

Notes:

WetFeed: Strategies to improve the microbial quality of liquid feed and optimise growth in grow-finisher pigs

F.M. O' Meara[1,2], J.V. O' Doherty[3], G.E. Gardiner[2], P.G. Lawlor[1]

[1]Pig Development Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork; [2]Waterford Institute of Technology, Co. Waterford; [3]University College Dublin, Belfield, Dublin

Up to 70% of Irish pigs are liquid-fed. Optimising liquid feeding practices to increase feed acceptability, reduce wastage and ultimately improve feed efficiency will reduce feed cost.

A microbiological assessment of liquid feed at three sampling locations (*mixing tank, freshly delivered feed to troughs and residual feed in troughs prior to the next feed*) was carried out on eight commercial pig units. Spontaneous fermentation in liquid feed, as indicated by increased Lactic acid bacteria (*LAB*) and yeast counts and a decreased pH was found the longer feed had been mixed. Liquid co-product inclusion (*pot-ale syrup and whey*) reduced pH, counts of LAB, E. coli, and mould and increased counts of yeast. A low starting pH is desirable for good microbial quality in liquid feed.

Two controlled fermentation methods were compared with fresh liquid and wet/dry feeding; (1) Single space wet/dry feeders, (2) Fermented cereal diet with the cereal fraction fermented prior to feeding, (3) Fermented whole diet and (4) Fresh liquid diet. Fermenting the whole diet resulted in a worsened average daily gain (*ADG*), feed conversion efficiency (*FCE*) and live weight at slaughter compared with the other three treatments. There were no differences between the other three treatments for ADG, FCE and final liveweight.

Organic acid inclusion will also reduce the pH of liquid feed. A benzoic acid product (*VevoVitall®, DSM Nutritional Products, Basel, Switzerland*) was included in the diet at 0, 2.5, 5 and 10kg/t. While the microbiological quality of the liquid feed was more stable with acid inclusion, production advantages were not observed in the pigs. Other acids may have a greater impact and are currently under investigation.

With no advantages from fermentation, fresh liquid feeding was compared with dry and wet/dry feed delivery systems. The experiment combined two feed forms (*meal and pellets*) and three feed delivery systems (*dry, wet/dry and liquid*). Pelleting resulted in a better ADG and FCR. Dry feeding resulted in the best FCE while liquid feeding produced the highest ADG.

In an attempt to optimise liquid feeding, four water-to-feed ratios were compared. After an initial analysis it seems that a water-to-feed ratio of 3:1 on a fresh matter basis may be optimal for FCE (*NOTE: experiment on short-trough sensor system*). Further analysis of these results is required.

Take home messages:

- Limit spontaneous fermentation by feeding smaller and more frequent feed splits
- Acids will reduce feed pH and improve the microbiological quality of liquid feed
- Restricted (*long trough*) feeding may limit spontaneous fermentation
- Fermentation of whole diets reduces pig growth performance
- Dry feeding improves FCE but liquid feeding results in faster growth rates
- A water-to-feed ratio of 3:1 (*FM*) may be optimal to improve FCE (*provisional results*)

Notes:

Farrman: Investigation of the effects of free farrowing crates on sow and piglet behaviour and welfare

O. Kinane[1,2] and K. O'Driscoll[1]

[1]Pig Development Department, Teagasc, Moorepark, Fermoy, Co Cork; [2]School of Biological, Earth and Environmental Sciences, University College Cork

Concerns about animal welfare have meant that farming systems that confine and restrict the sow during gestation have been banned in the EU. Farrowing crates (*CRATE*) however, have remained in use as they play an important role in protecting piglets from crushing. Farrowing crates not only restricts the sows' movement, but also prevents her from performing pre-farrowing and maternal behaviour that is normal at this time. Use of Free Farrowing Pens (*FREE*) is thus beneficial for sow welfare, allowing freedom of movement and permitting sows to perform normal behaviours. There may also be benefits to piglet welfare as they can interact more with the sow, and have better access for feeding. The use of FREEs could also contribute to a positive image for the Irish pig industry. This project aims to determine whether use of FREE can improve the welfare of commercial sows and piglets, compared with traditional crates, while maintaining current production rates.

A total of 60 sows were assigned to one of two treatments, FREE or CRATE across five batches (*six sows/treatment/batch*). In CRATE, sows were confined from approx. one week prior to farrowing until weaning. In FREE sows were confined in a crate from approximately one day prior to three days post farrowing; aside from this time the crate was opened so that the sow could move freely around the pen. Sow measurements (*weight, back fat, locomotion score, hoof score and tear stain scores*) were taken at entry to farrowing house and at weaning. Piglet (*n = 851; FREE = 414, CRATE = 437*) mortality, weights, and behaviour observations were taken throughout lactation, and hoof lesions at weaning.

Total mortality before day 4 was 88 (*10.3%*), with exactly half (44) in each treatment. After day 4, 38 piglets died (*4.5%*); with 71% (*27*) in FREE and 29% (*11*) in CRATE. However, growth rates were better in FREE and thus total litter weaning weight was the same in each treatment. There was no effect of treatment on sow weight, back-fat, locomotion score, hoof score, or tear staining, or on farrowing duration. Piglets from FREE crates had worse hoof health at weaning than CRATE, perhaps due to increased activity, but they performed less damaging behaviour.

Take Home Message:

- Although there was more mortality in FREE once the sow was released from the crate, litter weight at weaning was the same as CRATE due to increased growth rates in FREE piglets.
- FREE piglets performed less damaging behaviour, which could have implications for later life.
- Further research is needed to determine the best management strategy; opening crates only four days post farrowing may pose a high risk for crushing in larger litters.

Notes:

Using the Teagasc Pig Production Model as an investment decision tool

J. A. Calderón Díaz[1], L. Shalloo[2], M. McKeon[1], G. McCutcheon[3], E. G. Manzanilla[1]

[1]Pig Development Department and 2Livestock Systems Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork; [3]Pig Development Department, Teagasc Oak Park, Co. Carlow

Teagasc Pig Production Model (*TPPM*), a stochastic simulation model of a farrow-to-finish pig farm, was developed to investigate effects of changes in pig production systems on farm profitability. The TPPM allows realistic scenarios to be tested before implementation, and thus it can be used as a decision tool in different aspects of production such as investments, nutrition, welfare and health.

We investigated the impact of two changes in technical performance scenarios in farm net profit and compare them with the financial performance of a typical Irish pig farm (*TPPM FARM*). In all scenarios, a 775 sow farrow-to-finish farm with weekly farrowing batches with a mean of 2.38 litters and 26.25 pigs produced per sow per year was simulated. The modeled annual sow mortality and culling rates were 4.9% and 50.1%, respectively. Piglet, weaner and finisher mortality and were set at 10.9, 2.85 and 2.49%, respectively. The first scenario involved the construction of extra finisher accommodation to increase live weight at sale by 15 kg (*EXTRA ROOM*) by keeping pigs on farm for two more weeks. In total, 830 new finisher spaces were required at €275 per space for a total investment of €228,250. The second scenario involved using phase feeding by providing finisher diets earlier i.e. from 28 kg of BW weight instead of 38 kg of BW and the introduction of a second finisher diet from 70 kg of BW. For this scenario, a new feed bin was installed in the farm at a total investment of €10,000 euros. Both scenarios were financed through a term loan (*15 years at a nominal interest rate of 5%*) and depreciated over a 20 year time frame. To account for uncertainty, stochastic simulation for feed ingredient costs and carcass prices was performed using the Microsoft Excel @Risk. A total of 10,000 iterations were done for each risk variable.

Both the EXTRA ROOM and the EARLY FINISHER scenarios improved net profit. The EXTRA ROOM scenario required 23.4% more finisher feed but sold 242.7 extra tons of meat (+14.7%) per year compared with the TPPM FARM resulting in an increase of 14.4% in pig sales. The EARLY FINISHER scenario used 40% less weaner feed and 12% more of finisher feed than the TPPM FARM reducing feed cost by 1.8% with no difference in the kg of meat sold or total income. Results from the risk analysis showed that when the farm applied the EXTRA ROOM scenario changes, annual net profit increases by 70.1% while changes in the EARLY FINISHER scenario increased annual net profit by 13.9%. However, there was a greater risk associated with the EXTRA ROOM scenario than with the EARLY FINISHER scenario compared with the TPPM FARM. This was shown by the 90% confidence interval (5% to 95%) of the annual mean profit: €119,606-275,539 for TPPM FARM, €246,320-426,809 for EXTRA ROOM and €146,685-303,590 for EARLY

FINISHER scenarios. Effects on meat quality associated with increasing live weight at sale were not taken into consideration and the risk associated with EXTRA ROOM investment could be higher.

Our results indicates that farmers trying to improve profitability with minimum investment or with no access to large amounts of credit could implement changes similar to those in the EARLY FINISHER scenario without increasing risk or impacting farm liquidity and solvency.

Notes:

PLFPigCarc: Optimizing feedback of computerized meat inspection findings and Precision Livestock Farming tools on farm to improve pig health, welfare and carcass quality

L.A. Boyle[1], Joana Cardoso Pessoa[1,2], Tomas Norton[3], Conor McAloon[2]

[1]Pig Development Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork ; [2]School of Veterinary Medicine, University College Dublin, Belfield, Dublin; [3]M3-BIORES-Measure, Model & Manage Bioresponses, KU Leuven, Belgium

Worldwide the pig industry continues to suffer substantial financial losses due to respiratory disease, and this is also the main reason for antimicrobial (AM) use in growing-finishing pigs in Ireland. Although AM use in the treatment of disease is of vital importance to maintaining pig health and welfare, mis-use of AM is contributing to antimicrobial resistance. Prudent AM use in pig production can be achieved through improved housing and husbandry of pigs, stricter biosecurity practices and vaccination programmes and early and precise diagnosis.

Precision Livestock Farming (*PLF*) tools are playing an increasingly important role in the early diagnosis of disease in intensive production systems. The Pig Respiratory Distress Package (*SOMO*) performs continuous and automated measurements of cough sounds, issuing a Respiratory Distress Index (*RDI; average number of coughs per pig per 24 hours*). It was developed to give farmers an objective measure of pig cough occurrence throughout the entire farm. Combining this information with data on lung pathologies and other meat inspection (*MI*) findings from the slaughterhouse could achieve improvements in animal health and welfare and a reduction of AM use. The aim of this study was to establish associations between the RDI and lung pathologies at slaughter and to determine the relationship between MI data and pig health and welfare on farm.

Experiment 1:

Eight SOMO boxes were installed on a commercial wean-to-finish farm. A total of 1573 pigs from four consecutive batches were monitored from 25 ± 5.3kg to slaughter at 114 ± 15.4Kg, when their lungs were individually scored for pneumonia, scarring and pleurisy lesions. The relationship between lung lesions and weekly RDI was assessed. There was good association between lung pathologies recorded at slaughter and coughs recorded on farm by the SOMO boxes particularly during the finisher stage. Coughing was recorded in the earlier production stages but was not reflected in lung lesions at slaughter indicating that further research is required to validate the SOMO package for use with weaner and grower pigs. Further studies are also needed to clarify differences in levels of coughing throughout the production stages, and to verify the baseline coughing frequency in healthy pigs.

Experiment 2:

All 1573 pigs were individually identified and weighed on arrival at the farm and were followed for 13 weeks until slaughter. There was no in-feed or water medication and all parenteral AB administrations were registered. At 18 weeks of age, pigs were individually scored for tail and ear lesions (*scores 0 to 4*) and

hernias, lameness and bursitis were recorded as present or absent. At slaughter, all partial and total condemnations as per the decision of the acting veterinary inspector were registered. Data on lung lesions (*pneumonia, dorso-caudal and cranial pleurisy*) and pericarditis were also collected. Average daily gain (*ADG*) was calculated for the full time period. On farm, ear lesions were the most prevalent condition, affecting 33.3% of the pigs, followed by bursitis (20.0%), tail lesions (11.5%), lameness (4.5%) and hernias (3.4%). ABs were administered to a total of 244 pigs (15.5%). ADG was 990 ± 120.8 g/day. Regarding slaughterhouse findings, pneumonia was the most prevalent lesion (21.4%), followed by pericarditis (17.8%), cranial (15.8%) and dorso-caudal pleurisy (12.1%). Pigs partially condemned amounted to 11.7%, with 12 carcasses being fully condemned (0.8%).

Conclusion

Results showed that ADG was negatively associated with ear lesions and AB use, and positively associated with bursitis. Associations between partial condemnations and AB treatment; full condemnations and hernias; presence of dorso-caudal and cranial pleurisy and AB treatment; pericarditis and ear lesions; ADG and dorso-caudal and cranial pleurisy were also found.

These findings indicate a detrimental association between ear lesions and performance and pericarditis. A plausible explanation for the link between ear lesions and pericarditis is that they may serve as an entry point for pathogens. However, regarding ear lesions and performance the causal direction is less clear. The association between higher ADG and bursitis is related to a greater mechanical stress on the joints in heavier pigs when resting on concrete flooring. There were several associations between AB treatment and the slaughterhouse variables. As expected, AB use was negatively associated with ADG. This indicates that even when pigs are treated the burden of infectious disease influences performance. ADG was negatively associated with pleurisy, one of the most prevalent lesions found in finisher pigs at slaughter. This is in line with the results obtained in a cross-sectional study involving 56 Irish farrow-to-finish pig farms. These results confirm the need for the implementation of prevention plans and management improvements to reduce AB use and improve performance.

These data provide the first evidence of an association between severe ear lesions and pig performance and pericarditis. They also indicate the usefulness of on-farm measures of AB use, lesions related to pig welfare (*i.e. ear lesions*) and ADG in complementing the food chain information, safeguarding pig health, welfare, and public health.

Notes:

Starting Research

Preventing transmission of MRSA from pigs to humans through competitive exclusion (ExcludeMRSA)

D. Crespo-Piazuelo[1], P. Lawlor[1]

1Pig Development Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork

Pigs, like other domestic animals, can act as a reservoir for Livestock-Associated Methicillin-resistant Staphylococcus aureus (*LA-MRSA*). Farm workers are at risk for acquiring LA-MRSA through direct contact with pigs and occupational dust exposure. In the recent years, there has been an increase in reported human cases of LA-MRSA originating from pigs. Therefore, there is a need to reduce MRSA colonization in pigs and their subsequent transmission to humans.

In a pilot study of the nasal microbiome it was found that piglets become MRSA positive only a few days after birth. The presence of several other bacterial species was negatively associated with the presence of MRSA. The ExcludeMRSA project aims to establish the effect of bacterial competition on the transmission of LA-MRSA from pigs to humans by identifying bacterial strains in the nasal microbiome which are positively and negatively associated with the carriage of MRSA (*or S. aureus in general*) in piglets. The strains that are negatively associated with MRSA presence will be isolated from the collection of strains from each of the investigated piglets. Specific strains will be fully sequenced and screened for safety and they will be administered individually or as a mixture of strains in a nasal spray to new born piglets to evaluate their effectiveness in reducing MRSA in the nasal passages of piglets over time.

In addition to Teagasc's involvement in this project, it includes partners from University College Cork as well as partners from The Netherlands (*Utrecht University*) and Germany (*EW Nutrition GmbH*) and will involve a high degree of collaboration.

Notes:

Antimicrobial resistance in Irish Pig production

L. O'Neill[1,2], M. Rodrigues da Costa[1,2], N. Leonard[2], E.G. Manzanilla[1,2]

[1]Pig Development Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork; [2]School of Veterinary Medicine, University College Dublin, Belfield, Dublin

The AMURAP project has collected antimicrobial use (*AMU*) data from Irish pig and poultry farms and now is focused on studying antimicrobial resistance (*AMR*). A project investigating antimicrobial resistance on pig farms will commence in summer 2019.

Antimicrobial resistance in bacteria from food producing animals is of concern because there is a risk that this resistance may be transferred, directly or indirectly, to humans. Intensive production sectors, such as pigs, are focused on due to higher levels of antimicrobial use. In Ireland, samples are collected from pigs at slaughter every two years and the data are submitted to the European Food Safety Authority (*EFSA*) and European Centre of Disease Control (*ECDC*) monitoring project. Zoonotic species such as Salmonella spp. are studied due to their significance to public health while Escherichia coli, which live normally in the gut, are studied due to their ability to transfer AMR to other bacteria. The latest results, from 2017, indicate high levels of resistance to antimicrobials commonly used in pig production such as tetracyclines and sulphonamides. While resistance to the most important antimicrobials for human health such as fluoroquinolones and cephalosporins are low, they were increased compared to 2015.

Research has shown an association between antimicrobial use and resistance and suggests that this resistance peaks after weaning and decreases thereafter. However, further research is needed to understand the dynamics of antimicrobial resistance at farm level. Our project will follow batches of pigs from 10 farms (*five with high AMU, five with low AMU*) and measure antimicrobial resistance throughout the pig's life cycle. The project aims to provide a better understanding of how AMR evolves through the production period, how it is affected by antimicrobial use and to identify which patterns of use present the highest risk.

Conventional culture techniques will be used to determine levels of resistance in E. coli and Salmonella spp. in each stage of production and at the slaughterhouse. Particular attention will be paid to resistance amongst E. coli to fluoroquinolones and cephalosporins. AMR may also be measured by identifying and quantifying the genes causing antimicrobial resistance that are present in the bacterial population of the pig's gut (*this is known as the 'resistome'*). This technique, known as metagenomic sequencing, will be used to characterise the resistome and determine how it evolves through the production cycle and how it is affected by antimicrobial use.

SWAB & Safefood: A role for social sciences in biosecurity, welfare and AMU

A Macken-Walsh[1], Aine Regan[2], L. Boyle[3], E.G. Manzanilla[3], C. McAloon[4]

[1]Rural Economy & Development Programme, Athenry, Co. Galway; [2]Rural Economy & Development Programme, Ashtown, Dublin. 3Pig Development Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork; [4]School of Veterinary Medicine, University College Dublin, Belfield, Dublin

Surveillance Welfare and Biosecurity of farmed animals (*SWAB*) will address major current and emerging animal health and welfare problems in the Irish agricultural industry. This will be achieved through a genuinely interdisciplinary programme that responds to three related research topics: factors influencing utilisation of DAFM animal health surveillance and diagnostic services; multi-stakeholder perspectives and behaviours impacting on animal welfare; and quantification of the benefits of farm-level biosecurity practices.

The Safefood project, Use of antimicrobials in animal health on the island of Ireland: knowledge, attitudes and behaviour, will collate a baseline data on current farm-level antimicrobial usage on the island of Ireland and create a portfolio of practice-ready solutions which can be used to reduce antimicrobial usage and encourage the uptake of alternative strategies for animal health management.

These projects use a range of expertise from the disciplines of sociology, psychology, economics, veterinary medicine, animal welfare and epidemiology. Combining these research areas into a single project facilitates more efficient use of resources by enabling cross-pollination of ideas (*interdisciplinarity*); sharing of expertise; and efficiencies in the collection, acquisition and analyses of data.

Involvement of representatives from DAFM, Animal Health Ireland, the farming community and industry will ensure that outputs are appropriately balanced between scientific enquiry and practical application as "ready to go" tools. In ensuring this methodologically, these projects use participatory action research methods involving all stakeholders (*farmers, practicing veterinarians, industry, animal health professionals, consumers and other actors*) to create policy/veterinary/extension tools that put into practice and create direct impact of research findings generated by the project in operational settings.

Notes:

PigFeed: New feeding programs and facilities for Irish finishing pigs

E.G. Manzanilla[1], Jordi Camp Montoro[1,2]

[1]Pig Development Department, Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork; [2]Departament de Ciencia Animal i dels Aliments, Facultat de Veterinaria, Universitat Autonoma de Barcelona, Spain

Previous research has indicated that diets in Irish pig farms are generally too high in protein and are targeted to maximum growth which in many cases does not mean maximum economic benefit. Different approaches modifying digestible lysine and NE of diets and the feeding programs have been tested in Moorepark and results indicate that there is considerable room for improvement in Irish pig diets and feeding programs.

This project will test diets/feeding programs currently used in commercial farms against new feeding programs designed by Teagasc to create awareness on farmers of the potential benefits they are not making. The research on feeding programs will be also combined with different facility designs for finisher pigs (*room vs. trowbridge*), management methods (*e.g. litter groups vs. mixed*) or genetics.

Some of the experiments to be carried out during 2019 and 2020 include:

- Performance of finisher pigs at densities 0.96, 0.80 and 0.69 m2 with wet-dry feeders (*10, 12 or 14 pigs per feeder*).
- Determination of the minimum levels of SID lysine that allows keeping maximum growth.
- Determination of the levels of SID lysine and NE that maximize profit.
- Determination of the maximum levels of maize that can be used in dry and wet feeding systems.
- Effects of mixing and re-mixing on finisher pig performance.
- Comparison of terminal male genetics available in Ireland.
- On farm weekly adjustment of diets based on regular feed analysis.
- Split-finisher with tailored diets for selected growth groups.
- Phase feeding programs of two and three diets.
- Differences in performance caused by disease.

Notes:

Acknowledgements

The Teagasc Pig Development Department would like to take this opportunity to acknowledge all farmers that have participated in research projects to date. We would also like to acknowledge the research technicians and staff of the Teagasc Pig Research Facility for their contributions to research, and to the Teagasc Pig Advisors for their assistance.

Pig Development Department Contact List

Head of Department		
Name	*Telephone*	*E-mail*
Dr. Edgar Garcia Manzanilla	076 1112299 087 9614454	edgar.garciamanzanilla@teagasc.ie
Ciarán Carroll	025 42388 087 2462925	ciaran.carroll@teagasc.ie
Research		
Name	*Telephone*	*E-mail*
Dr. Keelin O'Driscoll	076 1112289	keelin.odriscoll@teagsc.ie
Dr. Laura Boyle	076 1112389 087 9295364	laura.boyle@teagasc.ie
Dr. Peadar Lawlor	076 1112217 086 8214674	peadar.lawlor@teagasc.ie
Advisory		
Name	*Telephone*	*E-mail*
Dr. Amy Quinn	076 1112723 087 3779015	amy.quinn@teagasc.ie
Gerard McCutcheon	059 9183503 087 8303969	gerard.mccutcheon@teagasc.ie
Michael McKeon	025 42259 087 6739178	michael.mckeon@teagasc.ie
Emer McCrum	076 1112910 087 7940974	emer.mccrum@teagasc.ie
Louise Clarke	049 4338634 087 6177268	louise.clarke@teagasc.ie

Teagasc Pig Development Department,
Teagasc,
Moorepark,
Fermoy,
Co. Cork

Tel : 353 (0)25 4257

www.teagasc.ie

Agriculture and Food Development Authority

Fermoy Print & Design 025-31355