Pig Development Department
Moorepark

Teagasc Pig Research Dissemination Day 2015

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Tuesday 12th May: Teagasc, Moorepark, Fermoy
Friday 15th May: Cavan Crystal Hotel, Cavan

Teagasc
Agriculture and Food Development Authority

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Presentations

Posters

Presentations

Environmental Enrichment and Nutritional Strategies to Reduce Tail Biting (ENTAIL)

Keelin O'Driscoll

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

Pigs are highly motivated to perform exploratory behaviours, as in their natural environment they would have spent a high proportion of their time performing exploratory and rooting behaviour in their search for food. The key characteristics of a substance that sustains interest for growing pigs are that it should be ingestible, odorous, chewable, deformable, and destructible. Providing this type of material in commercial pig farming is known as providing environmental enrichment. With regard to commercially produced pigs, successful enrichment should not only maintain or improve levels of health and welfare, but should also improve the economics of the production system, and be practical to employ. Unfortunately, in commercial facilities it can be very difficult to provide material that fulfils the criteria listed above, and as a consequence the pigs' normal exploratory behaviour is often directed towards other pigs, particularly in times of stress. This results in tail-biting, one of the most serious health, welfare and production problems in commercial pig production.

Docking of pigs' tails is used as a control mechanism for tail biting, yet even so, tail lesions due to biting are present in up to 70% of Irish pigs. Routine tail-docking is forbidden in the EU, and thus research into materials that can be provided in commercial, slatted systems is urgently needed. This project will investigate the efficacy of several enrichment materials on pig welfare. We will initially investigate the efficiency of compressed straw and wood, and then move on to inorganic (*rubber*) options. Straw is extremely effective as enrichment, particularly deep bedded straw. However, in Irish systems this is not an option due to the fact that our systems are typically slatted. Compressed straw blocks are used in other countries and can be effective, and thus could be a viable alternative here. One drawback to this however could be that the blocks may be used very quickly, which incurs a financial and labour cost. Anecdotally, farmers in other countries report that the replacement rate of compressed blocks could be dependent on the diet of the pigs.

Thus we will also investigate whether fibre level can impact replacement rate. Wooden 'chew' posts are an alternative to straw, but there is little research on the most effective type of wood (*e.g. hard or soft wood*). Moreover, wood may be a cheaper option than straw in Ireland. Thus we will also investigate this as an option, and as well as taking measures of pig health, welfare and production, we will monitor the rate of use of the wood and the hardness. Once we have carried out initial investigations into these materials on short tailed pigs, we will investigate the feasibility of managing pigs with undocked tails using the most effective enrichment strategies identified.

As well as looking at organic options, it could be possible that rubber devices that have some or all of the criteria that that are important to pigs could also be used either alone, or supplemental to wood or straw. This type of device also has more potential to be provided as a floor based device, rather than attached to the side of the pen or the ceiling, which provides further appeal to the pig as it can be moved about. Thus in the later stages of the project, we will investigate this type of enrichment, as well as factors such as the allowance of enrichment per pig, and whether some of the pigs in the pen dominate the use of the devices (*e.g. the pigs that are more likely to bite*). The first step to our work is to gather some feedback from producers, about the scale of the problem, what types of enrichment are in use, and how the problem is dealt with currently. Results from this survey should be available within the next few months, and will help us to develop the project further.

Acknowledgement

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Exploring the link between poor welfare, production diseases, antimicrobial usage and resistance on Irish pig farms (WELPIG)

Laura Boyle, Keelin O'Driscoll and Edgar Garcia Manzanilla
Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork.

The problem of antimicrobial resistance (*AMR*) represents a global threat to human and animal health. In the pig sector AMR is linked to the over/misuse of antibiotics. This problem is a feature of prescribing practices by both private veterinary practitioners (*PVP*) and pig farmers and of management/housing problems on farms leading to a high disease burden. The premise of the WELPIG project is that such issues are reflected in pig welfare indicators which can be incorporated into an audit tool for use by stakeholders to reduce antibiotic usage.

This project represents a collaboration between Teagasc researchers and Dr. Nola Leonard in UCD but it overlaps considerably with several other on-going projects on pig health and welfare (*i.e. PIGWELFIND and PathSurvPigs*). Two post graduate students are working on the project. Ana Vale, who holds a Newman Scholarship from the Veterinary Council of Ireland and is based at UCD, will establish the link between pig welfare, disease and AMR on farms. Ana's work commenced with a comprehensive survey of production data, pig management practices, biosecurity, nutrition, welfare, health and uptake of training and advisory services which was sent to Teagasc clients in October 2014. Thus far Ana found that almost 20% of respondents have 3 or more veterinarians providing services to their unit.

This practice is associated with over/misuse of antibiotics and is therefore a potential risk factor for AMR. Ana's work will culminate in the molecular typing of microbes with Dr. John Egan (*CVRL, Backweston*). Alessia Diana is a Teagasc funded Walsh Fellow on the WELPIG project who is working towards identifying management practices to reduce antibiotic usage on Irish pig farms. Her research commenced with an in-depth evaluation of the implications for pig performance, health and welfare as well as antibiotic use of removing antibiotics from the feed of first and second stage weaner pigs on a commercial farm (*results presented elsewhere in these proceedings*). Social science will also form a major component of Alessia's work and with the participation of Dr. Sylvia Snijders of the University of Westminster in London, stakeholder interviews will be structured to understand and overcome barriers to the adoption of technologies to reduce antibiotic use.

Ultimately it is hoped that an audit tool can be developed for use by producers and their PVP's to monitor antibiotic use. WELPIG will run for four years (*2014-2017*) with the following objectives:

- To determine risk factors (*housing, management, nutritional, biosecurity etc.*) for antimicrobial usage (*both medicated feed and parenterally administered medication*) on Irish pig farms

- To determine specific information on the social drivers for antimicrobial prescribing by veterinarians and pig farm personnel
- To quantify the range and extent of antimicrobial usage in the production cycle in both high and low usage herds and to determine the relationship with pig welfare
- To investigate the relationship between antimicrobial usage and disease levels as determined on-farm and at slaughter
- To investigate in detail the relationship between antimicrobial usage and antimicrobial resistance, in particular to antimicrobials designated as critically important for human health. This information will be used to evaluate the public health consequences of practices which result in high antimicrobial usage on pig farms.
- To evaluate differences in practices and attitudes towards 'animal care' between low and high antibiotic usage farms in terms of effects on pig health and welfare during the production cycle
- To develop an 'audit tool' for use by the pig industry to assist in reducing antimicrobial usage.
- To conduct a cost/benefit analysis on interventions to reduce microbial use
- To initiate the dissemination and education re. the use of this audit tool to the pig industry

Identification of practices to reduce antibiotic usage on Irish pig farms and understanding and overcoming barriers to their adoption (WELPIG)

Edgar Garcia Manzanilla and Laura Boyle
Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork.

A major objective of the WELPIG project is to assess the effects of removing in-feed antimicrobial treatments on the performance, health and welfare of pigs on commercial pig farms. The first on-farm assessment took place between September 2014 and February 2015 in a 300-sow farm positive to influenza, PRRS and APP and with regular episodes of tail biting and ear biting. Not all farms are suited for the removal of in-feed antimicrobials and this possibility has to be discussed between the farmer, PVP and the nutritionist before proceeding. In this particular case, before the antimicrobials were removed, the farmer was recommended to reduce stocking densities and to include enrichment in all pens. Injected antimicrobials were still allowed following PVP´s recommendations for sick animals.

During 6 weekly batches of 140 pigs, weaned pigs in the farm were divided in two groups, one group remained the same receiving sulfadiazine-trimethoprim in the diet following manufacturer instructions and the second group received the same diet but in-feed antimicrobials were removed. Teagasc personnel followed the pigs weekly for growth performance, welfare indicators, mortality and injected antimicrobial treatments from weaning to slaughter house. Slaughter house lesions were also recorded.

Pigs were weaned when they were 30-32 days old and were kept in a first weaner stage for 4 weeks and then moved to a 2nd weaner stage facility for 4 more weeks. Anti microbial treatment was included during these 2 stages and then removed during the finishing stage. Pigs treated with in-feed antimicrobials were 1 kg heavier by the end of the first stage and 2 kg heavier by the end of the second stage. This difference in weight was maintained until the end of the finishing period but it did not increase during this stage. Intake was also higher for animals treated with antimicrobials resulting in the same FCR for both groups, treated and untreated, during all production stages.

Mortality, tail biting and lameness prevalence were similar in both treatments. No disease outbreaks were registered during the trial and lesion monitoring in the slaughter house showed an overall reduction in pleurisy from 33% at the beginning of the experiment to 5% at the end. However, pigs without in-feed antimicrobials required twice the amount of injected antimicrobial treatments during the first weaner stage compared to pigs with in-feed antimicrobials. Even with this increase in injected treatments removal of antimicrobials from the feed resulted in a 90% reduction in overall antimicrobial use.After the trial, the farm removed all in-feed antimicrobial treatments and is currently being monitored.

Development of ante and post mortem meat inspection of pigs as a welfare diagnostic tool (PIGWELFIND)

Laura Boyle

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

PIGWELFIND (*'PIG WELFare INDicators'*) is a project being conducted by a collaborative team of researchers and pig advisors from Teagasc, University College Dublin, Queen's University Belfast and CAFRE in Northern Ireland. This three year project is investigating the potential for including indicators of pig welfare in the ante and post mortem meat inspection (*MI*) process. The indicators are mainly focused around 'welfare lesions' visible on the carcass such as tail injuries, skin lesions and loin bruising which reflect damaging behaviours performed by pigs (*i.e. tail biting, aggression and sexual mounting performed by entire males*). Thus far, the main focus of the work has been on determining the prevalence of different welfare lesions, validating them as indicators of pig welfare on farm and ascertaining how they are influenced by pre-slaughter handling (*e.g. mixing*) and processing (*i.e. scalding and dehairing*).

The influence of batch size, season, factory and jurisdiction effects have also been considered. An important finding thus far is that skin and tail lesions measured on the carcass are correlated with lesions measured on the farm during the animals life and prior to slaughter suggesting that in spite of potentially confounding effects of mixing, transport, slaughter and carcass handling and processing, information on these lesions can be used to inform farmers about the welfare of the pigs on their farm. Furthermore, links between important welfare lesions such as tail lesions and carcass/viscera condemnations, carcass trimming, lung health scores and ante mortem inspection outcome have been established. There is a strong relationship between tail lesions and carcass condemnation and trimming and it appears that pigs with lungs condemned for disease are more likely to be affected by tail injuries. These findings support the link between poor health and poor welfare on pig farms.

Furthermore, high batch-level prevalence of skin and tail lesions is associated with lower batch-level carcass weights and higher batch-level rates of partial carcass condemnation. An exercise to link the prevalence of tail lesions of different severities with farm performance characteristics (*e.g. days to slaughter, mortality rate*) is currently underway in order to better estimate the cost implications of this production disease and to understand particular farm characteristics which might be risk factors for tail biting. Work involving welfare inspections of pigs detained for special attention ante-mortem revealed inconsistencies between veterinary inspectors (*VI*) in criteria for detaining pigs and in terminology used to describe reasons for detention. VI also has a significant impact on viscera condemnation outcomes.

These findings indicate that additional training of VIs is required as well as the development of standardised terminology and scoring systems for the identification and classification of disease lesions. Findings from qualitative research with stakeholders in the pig industry revealed that the potential for inclusion of pig welfare indicators in the MI process is undermined by issues of trust and confidence between stakeholders as well as poor reporting structures/communication issues and technical limitations of current practices. Tolerance of certain welfare issues and acceptance of tail biting as an inherent component of pig production also undermine the potential for including tail lesion scoring in the MI process. During the final year of the project a protocol for extending on-line slaughter checks to include pig welfare indicators will be developed and costs and benefits of including them in the MI process will be analysed.

Investigation of respiratory disease on Irish pig farms, associated risk factors, and the relationship with performance, welfare and antimicrobial use (PathSurvPigs)

Laura Boyle and Edgar Garcia Manzanilla

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

While the Irish pig industry is highly intensive, productivity and profitability is less than that achieved in many other pig-producing countries in the EU. The reasons for this are multifactorial but in particular, there is little information available on the types and extent of diseases affecting pigs in Ireland and their economic cost to production. Respiratory disease is among the most significant infectious conditions contributing to production losses in the pig industry. However, there are few data available on respiratory disease, associated pathogens, morbidity and mortality in commercial pig units in Ireland, despite high levels of antimicrobial drug usage and the need to improve production efficiency, health and welfare. Such data are available for other countries.

However, due to differences in pig production in Ireland, including its highly intensive nature and large farm sizes, data from other countries are not directly applicable to Ireland. PathSurvPigs brings together, for the first time in Ireland, expert researchers in the areas of veterinary pathology, microbiology, epidemiology and welfare from Teagasc, UCD, CIT and CVRL, Backweston to address this knowledge deficit. Funding of over €700,000 coming from DAFM via the Research Stimulus Fund will be used to address the following objectives:

- To provide baseline herd health data (*i.e. prevalence*), for the industry, with an emphasis on respiratory disease
- To establish risk factors for the occurrence of disease, including respiratory disease in particular, on farms
- To identify critical gaps in diagnostics for pig diseases in ROI and to prioritise disease issues in the various production sectors
- To develop and transfer diagnostic technology and expertise to DAFM/ UCD to improve pig health, farm profitability, welfare, surveillance and to reduce antibiotic usage
- To establish the reasons for, and antimicrobial usage in, pigs which are removed from their peer-group early
- To examine the relationship between welfare indicator lesions, standards of housing/husbandry/feeding/medical care and disease status of pigs that die on Irish farms

- To undertake a cost-benefit analysis of measures which could be employed to improve disease control, welfare and biosecurity on Irish farms versus current losses due to disease, including morbidity and mortality

The research approach which will be adopted to achieve these objectives will include the collection of baseline data on respiratory pathology on farm and at slaughter, including cross-sectional data from 80 to 100 farms and data from longitudinal studies on up to 20 farms. Simple diagnostic approaches will be optimized for on farm use, in conjunction with sophisticated laboratory pathological and microbiological analyses where required.

A holistic approach will be adopted and data on respiratory disease will be set in the context of information on risk factors for disease, farm management and productivity, other disease problems, animal welfare and antimicrobial usage. This will allow comprehensive cost-benefit analysis to be completed and maximize understanding of the underlying reasons for disease occurrence on farms and cost to the industry.

Data on costs, risk factors and associated effects on pig welfare and productivity can then be used to drive management change on farms to control respiratory disease and associated losses, thus contributing to more profitable and sustainable pig production. Teagasc researchers Laura Boyle and Edgar Garcia Manzanilla, with the assistance of a post doctorate research fellow, are leading 3 of the 7 tasks included in PathSurvPigs which will run until November 2018.

Biosecurity scoring of Irish farm

Edgar Garcia Manzanilla

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

An EU initiative (*MINAPIG*) is evaluating biosecurity in farms in different countries following a method developed by Ghent University (*Biocheck*). Farms are being evaluated in Belgium, Denmark, France, Germany, Sweden and Switzerland with the same system. Due to the recent experience with PRRS and the current threat of PED, Teagasc, PVPs, UCD and the Central Veterinary Lab have started a working group in biosecurity in Ireland. As one of the first actions, the group is evaluating the biosecurity in pig farms to recommend future actions in farms.

The Biocheck questionnaire includes different aspect of biosecurity grouped as external and internal biosecurity. External biosecurity is focused on avoiding the entrance of new infectious agents in the farms. Internal biosecurity aims to avoid the spread of different infectious agents within the farm. The questionnaire provides the farmer with a score and a series of recommendations for that particular farm. The results so far of the EU study show that biosecurity varies a lot between farms and between countries but in all countries external biosecurity is better than internal biosecurity. Biosecurity tends to be better in big herds where some measures are easier to implement. High biosecurity levels are related to higher daily weight gains and to lower number of treatments. No relationship has been found between biosecurity and mortality or weaned piglet per sow per year.

In Ireland, as for all other countries, external biosecurity scores are higher than internal biosecurity scores. Ireland has good scores when it comes to external biosecurity although some particular aspects could be improved with some investment. However internal biosecurity scores are low, especially in aspects related to the farrowing and suckling period, compartmentalization of farms, use of equipment and cleaning and disinfection. These measures are in general time consuming but not that expensive.

So far 30 farms have been evaluated all over Ireland and the aim is to evaluate at least 60 farms representative of the different types of farm in the country. Recommendations from the results will be presented in different meetings and during the visits to the farms.

Online Pig Manure Brokering Tool (Cantogether)

Eimear Ruane[1],2, Peadar Lawlor[2], Seamus Clarke[3], Padraig Faye[4], James Humphreys[1], Jose Miguel Agudo Molina[5], Olivia Barrentes[6], Silvia Marton[7], Feliz Herzog[7], Erich Szerencsits[7], Réamonn Fealy[8]

[1] Livestock Systems Department, Teagasc, Moorepark, Fermoy, Co. Cork; [2] Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork; [3] Pig Development Department, Teagasc, Ballyhaise College, Ballyhaise, Co. Cavan; [4] CLW Environmental Ltd.; [5] Geoslab, C/ Carlos Marx, 6 CP 50015, Zaragoza (Spain); [6] Deparmennto De Ciencias Agrarias y Del Medio Natural, University of Zaragoza; [7] Agroscope Reckenholzstrasse 191 CH-8046 Zürich; [8] Spatial Analysis Group, Teagasc Food Research Centre, Ashtown, Dublin 15.

As part of the FP7 Cantogether project, an online tool has been developed to facilitate the communication between pig farmers and grassland/ tillage famers. In Ireland, pig manure is most commonly utilised by land application on neighbouring livestock farms. However, with the introduction of the Nitrates Directive (*S.I. No. 610, 2010*) many farms that previously accepted pig manure are already at capacity as the organic nitrogen (N) loading from livestock may already be at the limit of 170 kg N/ha. In addition, the phasing out of the transitional arrangements for the Nitrates Directive by 2017 will mean additional land must be sourced for spreading pig manure. The fact that mineral P is a finite resource in the world makes it all the more important that the P content in manure is sustainably used to its full potential in agriculture.

It has been suggested that pig producers should shift the focus of land application of pig manure to tillage ground. The advantage of this is that tillage can sustainably utilise larger volumes of pig manure compared to livestock farms. Cavan is the largest pig producing county followed closely by Cork and then Tipperary . One of the biggest challenges facing pig farmers located in these relatively pig dense counties is not only the distance between them and suitable spreadlands but the fact that pig farmers and recipient farmers simply don't know each other.

The online brokering tool is designed to facilitate communication between pig farmers and recipient farmers. Pig farmers using the system can search for a recipient farmer based on a number of factors including distance, the amount of pig manure they require and whether the farmer has storage for pig manure on his farm. The latter is particularly important in the case of tillage farms. The route calculator used in the brokering tool takes account of the method of transportation of the pig slurry and will therefore choose a route suitable for a truck or a tractor and tanker. The distance calculated is displayed on the website for the purposes of selecting a suitable recipient farmer but the farmer's locations are not disclosed. A tillage farmer who wants to source pig manure can search for a suitable pig farmer based on distance and volume available. The brokering tool also facilitates the exchange of grain between tillage and pig farms. Email serves as the first point of contact between farmers.

The objective of this project is to reduce the reliance of both the Irish pig producer and tillage farmer on imports of feedstuffs and chemical fertiliser, respectively. It also aims to develop an environmental and economic system for land spreading of pig manure on tillage farms. Pig manure has a distinct advantage over chemical fertiliser in that it is not only a fertilizer but it is cheaper and it increases the soil organic matter content. This project aims to reduce not only the environmental footprint associated with pig and crop production in Ireland but also the vulnerability of farmers to fluctuation in the cost of imports such as fertiliser and feed.

On-Farm Anaerobic Co-digestion of Pig Manure and Food Waste (Green Farm)

C. Dennehy[1], P. G. Lawlor[2], G.E. Gardiner[3], Y. Jiang[1] and X. Zhan[1]

[1]Department of Civil Engineering, College of Engineering and Informatics, National University of Ireland, Galway; [2] Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork; [3]Department of Science, Waterford Institute of Technolog.

The Irish agricultural sector is responsible for 29.1% of the total greenhouse gas (*GHG*) emissions generated nationally. The EU average contribution of agriculture to national GHG emissions is 9%. Due to the major increase in output occurring in the Irish agricultural sector currently, there is a pressing need to reduce and mitigate the GHG emissions from agriculture in order to meet EU commitments. While the pig sector is estimated to produce just 2% of total GHG generated by the agricultural sector, the centralized nature of pig manure collection makes it suitable for the development of on-farm anaerobic digestion systems. Such systems may significantly mitigate GHG emissions by generating renewable energy.

While the use of on-farm anaerobic digestion systems has grown significantly in Northern Ireland over the past 10 years, there has been little uptake of the technology in the Republic. This is due to the Renewable Energy Feed-In Tariff (*REFIT*) paid in the Republic of Ireland for the energy generated by such systems being half of that offered in Northern Ireland. Therefore the economic case for on-farm anaerobic digestion has been questioned. Manure alone generates relatively small amounts of methane. Previous studies have examined the possibility of anaerobically digesting manure with feed stocks known to generate high volume of methane (*such as grass silage*), in the hope of making anaerobic digestion commercially viable. These studies found that the cost of purchasing such feed stocks, in addition to the low REFIT, made such an approach not viable.

The Green Farm project aims to assess the feasibility of undertaking on farm anaerobic co-digestion of pig manure and food waste. Food waste is known to generate significant quantities of methane when anaerobically digested, however it may be unstable when digested alone. Digesting with manure will lead to a stable process with high methane yields. Farmers may benefit from gate fees from taking food waste from waste management companies, furthering the financial argument for such a system. This approach would also assist Ireland in meeting its EU targets of reducing the amount of biodegradable waste going to landfill.

The Green Farm project aims to

- Provide engineering and operational guidelines for anaerobic digesters treating pig manure and food waste.
- Assess the biosafety and agronomic quality of the digestate generated from the co-digestion process.
- Provide recommendations on how best to comply with regulations

surrounding anaerobic co-digestion of pig manure and food waste (*the Animal Byproducts Regulation particular*) while maximizing methane yields.

- Generate models which may be used to estimate methane yields and process stability of plants treating pig manure and food waste.
- Assess the economic and environmental viability of the concept of on-farm anaerobic co-digestion of pig manure and food waste.

Thus far, lab-based batch and continuous digestion experiments have been undertaken. The highest methane yields of 0.8L /L of reactor/day have been achieved with a 60% food waste 40% pig manure mix (*on a volatile solids content basis*). Therefore it is feasible that a 100m3 digester could generate 80m3 of methane per day, with the energy potential of 790kWh/day. If burned in a Combined Heat and Power (*CHP*) unit and the electricity sold at the current REFIT (*€0.15/kWh*) the gross annual income would be approximately €16,400 from energy sales only. Note however that higher methane yields are possible, with the highest yields to be determined by this on-going experiment.

Assessing the role of feed as a risk factor for Salmonella in Irish pig production

Peadar Lawlor[1], Anne Marie Burns[1], 2, 3, Gillian Gardiner[2] & Geraldine Duffy[3]

[1] Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork;
[2]Department of Science, Waterford Institute of Technology, Waterford;
[3]Teagasc Food Research Centre, Ashtown, Dublin 15

Salmonella carriage in pigs is a significant food safety concern in Ireland. Feed is a possible risk factor for Salmonella transmission to pigs. The objective of this study was to assess the role of feed in transmission of Salmonella to pigs.

Firstly, an in-depth study was conducted on 10 commercial pig farms with a history of high Salmonella seroprevalence in order to identify the production stages which were the principal harbours of Salmonella infection and to assess the occurrence of Salmonella in feed throughout these stages. Each farm was visited twice and a total of 2,985 samples, consisting of 926 faecal samples, 1,474 environmental samples (*from troughs and water drinkers*) and 585 feed samples (*from feed bins, bags and hoppers*), were taken across all production stages and analysed for the presence of Salmonella. Salmonella was detected in the pigs on nine of the farms. Overall, it was found in 14.9% of the faecal samples and in 9.2% of the environmental samples. This was to be expected, considering that the farms selected for this study had a history of high Salmonella seroprevalence. The highest proportion of faecal Salmonella-positive animals was detected in 2nd stage weaners (*21%*), finishers (*20%*) and gilts (*19%*). In total, 11 different Salmonella serotypes were recovered from the pigs and eight from the environmental samples, with monophasic variants of Typhimurium (*4,[5],12:i:-*) predominating in both sample types. These monophasic variants of Typhimurium are increasingly implicated as a cause of Salmonella food poisoning in humans.

Only 2.4% of feed samples taken across all production stages were Salmonella-positive. These originated on six farms and the main Salmonella serotypes isolated were also monophasic variants of Typhimurium (*4,[5],12:i:-*). Six (*43%*) of the positive feed samples originated on farms using liquid feed with the remainder (*8 samples or 57%*) coming from farms where pigs were dry fed. The Salmonella-positive feed samples were generally recovered at only one stage of production on each farm, although on one farm they were found in two stages (*dry sows and gilts*). Feed sampled from dry sows had the highest Salmonella prevalence. In order to establish if the Salmonella contamination originated from the feed, molecular typing of the Salmonella isolates was performed. On certain farms the strains recovered from the feed were also found to be shed by pigs in several stages of production (*i.e. identical MLVA profiles*). One of the Salmonella strains recovered was isolated from a feed bin containing 1st stage weaner pelleted feed indicating at least in this instance that Salmonella originated in the purchased feed.

The next phase of the study involved testing feed ingredients and compound pig feed sampled from feed mills (*five commercial feed mills and one home compounder*), supplying the above farms, for the presence of Salmonella. Salmonella was recovered from only two of the 340 feed ingredients analysed; wheat from one commercial mill and soybean meal from the home compounder, giving an overall prevalence of 0.6% in the feed ingredients. It was also detected in three of the 313 compound feed samples analysed, giving a compound feed prevalence of 0.95%. The Salmonella positive compound feeds were a dry sow meal and a dry sow pelleted diet, both sampled from the same feed mill and a finisher meal sampled from another mill.

The proportion of meal feed samples contaminated with Salmonella was 1.6%, whereas only 0.5% of pelleted diets were contaminated. All of the Salmonella isolates found in the feed ingredient and compound feed samples were monophasic variants of Salmonella Typhimurium. Molecular typing showed that the same Salmonella serotype was recovered from both ingredients and compound dry sow diet. Although positive feed ingredients and positive compound feed did not originate at the same mill it is likely that the consignment of positive feed ingredients had been shared between a number of mills. Molecular comparison of isolates was conducted to determine if any of the Salmonella strains recovered from the feed mills are the same as those found on the pig farms. Our data showed that there were two distinct strains (*MLVA profiles*) common to both feed mills and farms. The mill strains showed strong correlations with the strains isolated from two of the farms.

Pelleting reduced Salmonella prevalence and indicator bacteria (*Enterobacteriaceae*) counts in compound feed but did not completely eliminate contamination. This, together with the fact that compound feed had higher Enterobacteriaceae counts than ingredients, suggests that post-process contamination within feed mills is likely to be occurring.

Overall, although the prevalence of Salmonella in pig feed and feed ingredients was relatively low, even minor Salmonella contamination in feed has the potential to affect many herds and may subsequently cause human infection. For this reason Salmonella presence in pig feed must be considered an important risk factor for Salmonella in pigs. Furthermore, the recovery of an emergent Salmonella serotype and antibiotic resistant isolates is a potential cause for concern.

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Low cost solutions to control Salmonella in pigs

Hector Arguello[1]; Helen Lynch[1],2; Kavita Walia[1],3; Gillian Gardiner[3]; Nola Leonard[2]; Geraldine Duffy[1]; and Peadar Lawlor[2]

[1]Food Safety Department, National Food Research Centre, Teagasc, Ashtown, Dublin; [2] School of Veterinary Medicine, UCD Veterinary Sciences Centre, University College Dublin, Dublin; [3] Department of Science, Waterford Institute of Technology, Waterford; [4] Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork

Salmonella in pigs is a significant food safety issue in Ireland with a relatively high prevalence found in pigs and carcasses. This is a major concern for public health and for domestic and export pork markets. Although considerable effort has been put into the National Pig Salmonella Control Programme, it has not yet resulted in lower rates of Salmonella carriage or carcass contamination rates. Furthermore, farmers' demand solutions to reduce the Salmonella burden in their herds. The present project aims to develop feasible control strategies through the pork production chain (*sows, weaners, finishers and post-farm*) to reduce the prevalence of Salmonella on farm as well as offering solutions for the post-farm stages. A novel aspect of this project is that it will focus on the implementation and validation of low cost solutions to control Salmonella including a cost-benefit analysis of these intervention measures.

For this dissemination day, we want to present partial results from some of the project studies performed to date.

One project task aims to determine the role of sows and gilts in the transmission of the infection to their progeny. The study involves six farrow-to-finish herds in which we are tracking sows and gilts through a reproductive cycle (*service, gestation and farrowing*). Partial results demonstrate that sows rarely shed Salmonella during service and gestation. When the target sows and gilts reach the farrowing stage, their role in transferring Salmonella to the offspring will be determined. The results of the study will provide relevant information about which strategies should be performed in breeding animals.

Another task evaluates the usefulness of feeding acids to control infection on high Salmonella seroprevalence herds. An acid was evaluated on two farms and administered to finishers during the last month of their finishing period (*Adimix®; 3kg/T in feed*). Bacteriology results showed decreased Salmonella shedding in one of the farms while no effect was found on the other. The administration of the acid did not influence feed intake, growth rate or feed efficiency.

Finally we are performing a study to determine the impact of the Salmonella infection on production indicators on Irish pig farms. This study includes the determination of factors that promote and prevent infection. To perform this task, we are asking farmers to complete a survey with some questions about management, biosecurity, feeding practices and diseases present on

their farms. The more farmers participating in this survey the better will be the resulting advice available to Irish pig farmers. We want to determine if factors such as feed, washing and biosecurity practices can prevent/lessen the Salmonella infection of on Irish farms.

Farmers will be updated about the results of the project through the Teagasc Pig newsletter, Teagasc conferences and discussion groups with the advisors. Transfer of knowledge is assured via direct involvement of the Teagasc specialist advisors and via collaboration with relevant stakeholders in DAFM, the pig producers and processors.

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Isolation and evaluation of an effective probiotic for use as an alternative to in-feed antibiotics for pigs

Peadar Lawlor[1], Mari Luz Prieto[1, 2] & Gillian Gardiner[2]

[1] Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork;
[2] Department of Science, Waterford Institute of Technology, Waterford

The emergence of antibiotic-resistant bacteria has led to a European Union-wide ban on the routine addition of antibiotic growth promoters to pig feed. Therefore, there is a need for alternatives to antibiotics for pig feed applications. Probiotic bacteria are one such alternative. These are 'live microorganisms which when administered in adequate amounts confer a health benefit on the host'. The objective of this work was to isolate antimicrobial-producing bacteria and to evaluate their potential for use as probiotics in pigs. The marine environment was chosen as a source of probiotics, given that it represents an untapped source of potentially novel microorganisms and that antimicrobial production, an important probiotic trait, is common amongst marine microflora.

From an initial screening, 311 bacterial isolates were obtained from seaweed, sand and seawater. Of these, 15 isolates, identified as Bacillus licheniformis and Bacillus pumilus, were selected for their antimicrobial activity. Six were active against E. coli and Salmonella and for this reason were further characterised in vitro as animal probiotics. Resulting from this work, one B. pumilus isolate offered most potential as a probiotic feed additive for pigs. This was based on its antimicrobial properties, ability to survive simulated intestinal transit and absence of safety concerns.

Spores of this B. pumilus isolate were then fed to weaned pigs for 22 days to evaluate safety and efficacy in the live animal. The B. pumilus treatment decreased E. coli counts in the lower small intestine (*ileum*) as effectively as in-feed medication [in-feed antibiotic (*apramycin*) and therapeutic level of zinc oxide]. In addition, it did not have adverse effects on growth performance and it did not reduce beneficial bacteria (*Lactobacillus*) or short chain fatty acids (*an indicator of good intestinal health*) in the lower intestine, all of which were found with the medicated treatment. Furthermore, there were no signs of possible liver toxicity, which were unexpectedly experienced with the in-feed medication.

Overall, the results of this study indicated that this seaweed-derived Bacillus strain offered potential for use as probiotics in pigs. Following on from this work, a patent application has been filed for the probiotic strain and funding for a commercial feasibility study has been granted by Enterprise Ireland.

Acknowledgement

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ECO-FCE: Optimising feed efficiency and reducing the ecological footprint of monogastrics (ECO-FCE)

S.G. Buzoianu[1], U.M. McCormack[1], 2, D. Berry[1], G.E Gardiner[2], E. Magowan[3], F. Mansoor[3], B.U. Metzler-Zebeli[4], P. Varley[5] and P.G Lawlor[1].

[1]Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork; [2]Department of Science, Waterford Institute of Technology, Co. Waterford; [3]Agri-Food and Biosciences Institute, Hillsborough, Northern Ireland; [4]University of Veterinary Medicine, Vienna, Austria; [5]Hermitage Genetics, Kilkenny.

Background

The ECO-FCE project commenced in February 2013 and is co-financed by the European Commission. Through better understanding the interactions between animal genetics, gut structure and function, the microbial population of the gut and the attributes of feed, ECO-FCE will propose strategies to improve feed efficiency whilst also reducing the ecological footprint of pig production. The project is co-coordinated by Queen's University Belfast. It brings together 17 partners from across Europe, over 4 years, to conduct research focused on providing the European pig industry with innovative strategies and tools to feed a rapidly growing global population in an efficient and ecologically-friendly manner. The Teagasc Pig Production Department will play a central role in the project, leading one of its seven work packages while actively participating in all others.

Expected benefits

- Improved understanding of factors creating variation in monogastric digestion
- Identification of novel feeding systems and feed additives that improve gut health, optimise FCE and reduce N and P excretion and GHG emission in pigs.
- Identification of models to advance pig breeding for improved FCE
- Reduced feed costs for the pig sector thereby increasing profitability

Materials and methods

Gut structure, function and microbiota in pigs divergent for feed efficiency

- 500 pigs over 3 sites (*Ireland, Northern Ireland, Austria*)
  - » Common genetics
  - » Common protocols and diets
- Growth performance (*ADG, ADFI, back fat*) measured at 1-2 weeks intervals

- Slaughter performance, intestinal health and microbial profile assessed
- Selection of extremes within gender and litter
    - » Based on residual feed intake (*RFI*) – a better overall measure for feed efficiency
    - » Compared RFI (*lower is better*) with FCR (*lower is better*)

Results

- Males have better FCR and higher ADG than females
- Genetics and geographical site – major effects on performance
- Similar trends for growth performance when ranking on RFI and FCR
- FCR is more practical as a performance indicator in most circumstances
- RFI better to standardise feed efficiency ranking across production sites

Acknowledgement

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Feed analysis

Edgar Garcia Manzanilla
Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork

Pig diets in Ireland are very heterogeneous compared to other countries. There are an important number of home millers, some big companies producing complex diets to minimize costs and small companies offering simple diets that can be personalized to some extent. On the other hand, the feeding systems vary between farms with many farms using liquid feed systems. In this context it is important for many farmers to have information about the quality of their diets in order to reduce costs and optimize efficiency.

Teagasc has started visiting farms to collect feed formulations and feed samples to perform chemical analysis and compare the theoretical values with the actual analyzed values mainly for energy, protein but also fiber, fat and some minerals. Particle size will be also analyzed for the diets. Right now the analysis will be focused on finishing diets because this is the phase were the total cost of diets is more important and were more improvement can be done. In some cases, samples are taken in different points of the distribution system if a problem with system is suspected.

In future, a regular analysis plan will be proposed for the farmers and diets may be adjusted at a farm level if combined with growth curves for the pigs.

Posters

Nutritional strategies to increase piglets born alive and minimise piglet mortality (OPTIPIG)

K. Reid[1], K. O'Driscoll[1], E. Magowan[2], J. O'Doherty[3], P. Lawlor[1]

[1] Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork; [2]AFBI; [3]University College Dublin

The annual output per sow in Ireland increased from 21.6 to 24.5 pigs sold per sow per year between 2003 and 2013. Although Ireland has the fifth highest output per sow in Europe when compared to a number of other pig-producing countries, some countries (*e.g. Netherlands, Denmark and France*) have much higher output. Therefore, the aim of this research is to increase the number of piglets born alive per litter, and to ensure that the additional piglets are viable. The focus of the work is not only to increase mean piglet birth weight but also to reduce within-litter variation in birth weight (*which is a feature of larger litters*). These aims will be achieved through targeted nutrition of the sow during gestation, beginning with a study investigating supplementation with L-carnitine, L-arginine or a combination. Following this we will investigate addition of Vitamin D, DHA, Fish Oil, Lactose and Dextrose to the gestation diet, as well as the effect of increasing feed intake in late gestation.

The first study, in which L-arginine and, L-carnitine supplementation is being investigated as a means of increasing the number of viable piglets born alive per litter, commenced in a commercial sow herd during February this year. L-arginine is linked with enhancing placental efficiency and development which should increase blood flow to the foetus' and decrease numbers stillborn. Carnitine is associated with increasing the number of muscle fibres at birth, thus enhancing birth weight, as well as boosting piglet energy levels.

This trial will involve 600 sows, with 150 sows per treatment (*arginine; carnitine; arginine + carnitine; no supplementation*). The first sows to farrow (*approx. 8 per treatment*) will do so in mid-June, following which experimental sows will farrow every two weeks until early 2016. At farrowing the primary measures that will be taken are number of piglets born alive, stillborn and mummified, as well as birth weight. Additionally a number of litters will be chosen out of each treatment where we will focus more closely on piglet vitality.

Measures including birth order, farrowing duration, heart rate, snout colour, muscle tone, skin temperature, crown-rump length, abdominal circumference, meconium staining, latency to breathe/stand/reach the udder, weight at 24hours (*indicating colostrum intake*) and weaning weight will be taken. We will also follow a number of piglets right through to slaughter to investigate whether the supplement has any lifelong effects. Measurements relating to the sow will also be taken, including lactation feed intake, weaning to oestrus interval, subsequent farrowing rate, changes in sow weight and back fat and colostrum quality.

The next trial that we will carry out will investigate increasing feed intake in late gestation (*from day 80*), and will involve approximately 460 sows. In relation to the piglet the focus is on enhancing weight and energy reserves at birth. We also expect an increase in voluntary feed intake in the sows throughout lactation, which should increase milk production (*enhancing piglet performance*) as well as improving subsequent farrowing rate.

Finally, a series of more detailed studies will be carried out in Moorepark, during which all of the aforementioned supplements will be investigated in relation to colostrum quality, piglet vitality and placental efficiency.

The use of nurse sows to keep weak piglets alive (OPTIPIG)

Oceane Schmitt, Laura Boyle and Keelin O'Driscoll
Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork

The use of nurse sows is a management strategy used to deal with large litters. It consists of standardizing litter size by transferring surplus piglets from large litters (*i.e. more than 14 piglets*) to another sow whose litter has just been weaned. This strategy has benefits for the nursed piglets as there is less risk of rejection from the sow and no competition with biological piglets, compared to cross-fostering. Unfortunately, the nurse sow has to stay longer in the farrowing crate to rear the foster litter in addition to her own, which can lead to welfare and health impairments. In addition, piglet welfare may be compromised if they are weaned before 28 days. Two nurse sow strategies are usually used.

The "one-step" strategy involves a single nurse sow who rears a new litter after weaning of her own and thus, stays for up to 7 weeks in the farrowing crate (*i.e. 3 with her own piglets and 4 with the new litter*). The "two-step" strategy involves two nurse sows: one nurse sow weans her own litter and then receives the piglets of a second nurse sow which farrowed 4 to 7 days previously. This second sow receives a new litter composed of surplus piglets from large litters. In that case the nurse sows stay for up to 5 and 6 weeks in the farrowing crates. Piglets transferred at 4 to 7 days-old may also suffer from the separation from their dam.

In order to validate the efficacy of nurse sow strategies on reducing piglet pre-weaning mortality and to assess their effects on welfare and health of sows and piglets, an experimental study will be conducted on a commercial farm. At entry in the farrowing house, the sows will be scored for claw and limb lesions and lameness and their back fat thickness will be measured. At farrowing, experimental sows will be selected based on the number of piglets born alive (*min. 14*). The control treatment (*C sows*) will keep 14 of her own piglets until they are weaned. Sows in the "removal" treatment (*R sows*) will have some of their piglets removed so they keep a litter of only 12 piglets until they are weaned. At the same time nurse sows (*N sows*) will be selected based on the number of piglets weaned (*min. 12*) and mothering abilities.

At birth, the piglets will be weighed, measured and scored for vitality. Approximately 24 h after birth, the most vigorous piglets will be transferred from the removal sows to the nurse sows. Both one-step and two-step strategies will be used. Piglets from non-experimental sows will also be transferred to nurse sows to make up a litter of 12 piglets. Scores of lesions and measurement of back-fat will be done on nurse sows on the day of fostering. Salivary cortisol (*a stress hormone*) will be collected at different times following the transfer on all sows. Through lactation, behavioural observations of the piglets during nursing episodes will be performed and

piglets will be weighed and scored for lesions once per week. At weaning, piglets will be scored for lesions, weighed and observed for 20 min in their weaner pen. Thereafter, they will be weighted and scored for lesions at each fattening stage and at slaughter.

All sows will be scored for body lesions and lameness again in the end of lactation and their back-fat thickness will be measured. If they return to service after the experimental period, their reproductive performance will also be recorded. Any occurrence of disease will be recorded all along the experiment as well as cause of death (*if occur*), for both piglets and sows.

Effect of removal of in-feed antibiotics on skin lesion scores of pigs during the 1st and 2nd weaning stages (WELPIG)

A. Diana[1], 2, E.G. Manzanilla[1], R. Vial[1], N. Leonard[2], L. Boyle[1]

[1] Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork;
[2] School of Veterinary Medicine, University College Dublin, Belfield, Dublin 4.

The ability to include antibiotics (*ABs*) in pig diets has resulted in an overreliance on medication to treat and prevent illness in pigs under intensive production conditions. This practice is no longer sustainable because of the risk of AB resistance. Even if there are several studies which show how animal welfare is fundamental to ensuring good health, to preserve pigs from stress and diseases and consequently to guarantee efficient productivity; little is known about the effect on pig welfare of removing ABs from the diet. 'In-feed' AB are usually prescribed for gastrointestinal or respiratory diseases and are not likely to influence the performance of aggression or abnormal behaviours such as ear, tail and flank biting. The aim of this study was to evaluate the effect of removing AB from the diet and replacing with parenteral AB treatments on skin lesion scores of weaner pigs.

The hypothesis was that there would be no difference in skin lesion scores between treatments. The study was conducted on a commercial farrow-to-finish farm (*300 sows*) with a programme of in-feed AB treatment (*sulfadiazine-trimethoprim, 14.4mg/Kg body weight (BW)*/d; for 5 days/week). Every week for 6 weeks 70 pigs were weaned at 28 ± 2 days of age, weighed, tagged and sorted into 2 groups of approximately 35 pigs according to weight (*10.6 ± 0.7kg*). 'In-feed' antibiotics were removed from the diet of one group (*NO, n=6*) and maintained in the other group (*AB, n=6*). Furthermore, ten focal pigs were chosen per group. Pigs from both groups were parenterally treated with Amoxicillin (*15 mg/Kg BW during 3 days*) if and when required. At the end of the 1st stage, after a period of 4 weeks and 4 days each group was split into two pens of c. 15 pigs each in the 2nd stage (*NO, n=12 and AB, n=12*) for a further 4 weeks and 3 days. Data were recorded on a weekly basis for 9 weeks.

Skin lesions were scored on the focal animals according to severity: body (*BL, 0 to 6*), tail (*TL, 0 to 5*), ear (*EL, 0 to 3*) and flank (*FL, 0 to 3*). Our results show that body lesion scores tended to be higher in AB than in NO pigs during both stages (*P=0.09 and P=0.07; 1st and 2nd stage, respectively*). This reduction in the body lesion severity score of NO pigs may have been linked to reduced competition for access to feed associated with reduced growth rates in these animals (*as reported elsewhere in these proceedings*). However, treatment had no significant effect on the EL, FL and TL scores (*P>0.05*).

Moreover, we also found that there were significant changes in all of the lesion scores across time (*P<0.05*). These scores suggest that the development of ear and flank biting behaviour might be related to space restrictions

at the end of the 1st stage; while tail lesion scores in early weaned pigs appear to reflect injury associated with tail docking rather than tail biting behaviour. In summary, we can say that as expected, removing antibiotics from the feed of pigs had no effect on skin lesions reflective of behavioural abnormalities (*i.e. tail, ear and flank biting*). However, lower body lesion scores may suggest that there was an effect on aggressive behaviour.

Tail lesions on carcasses of Irish slaughter pigs in relation to producer association with advisory services (PIGWELFIND)

N. van Staaveren[1],2, D. Teixeira[2], A. Hanlon[1], and L. Boyle[2]

[1]School of Veterinary Medicine, University College Dublin, Belfield, Dublin 4;
[2]Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork

Tail biting is reflective of impaired welfare often related to disharmony between the pig and its environment and can range from chronic tail directed behaviour to severe tail biting. Currently much of the research focus elsewhere has been on outbreaks of severe tail biting and as such severe tail lesions are often the only tail damage recorded during meat inspection. However, even moderate tail lesions can have welfare or economic implications being associated with an increased risk of pathological lesions, carcass trimmings/condemnations and reduced carcass weight. In addition there are significant indirect costs at production level (*reduced growth, medicines, labour etc.*).

The aim of this study was to estimate the prevalence and variation between batches of pigs sent to slaughter in tail lesions with different degrees of severity. In addition, we investigated the effect of record keeping in association with advisory services on the prevalence of tail lesions with different degrees of severity. Two factories were visited for 3-4 days and two researchers scored each carcass after scalding and dehairing. Tail lesions for each pig in a batch were classified as none/mild, moderate and severe.

In total 13,133 carcasses were inspected from 73 batches coming from 61 farms. Moderate tail lesions were found in all batches while severe tail lesions were found in 76.7% of the batches. On average 26.8% of the pigs in a batch were affected by moderate tail lesions and 3.4% by severe tail lesions, but there was large variation between batches. Of the 61 farms investigated 23 were keeping records in PigSys and pigs from these farms had a lower odds of having none/mild tail lesions and moderate tail lesions. No difference was found for severe tail lesions.

It remains the question if these differences reflect a true beneficial effect of record keeping on the management of pig health and welfare or if farms that keep PigSys records have a different farm profile (*e.g. larger herd size or more stockpersons*) which could have influenced the prevalence of tail lesions. Information from the PigSys database could help us to try to establish if there is a relationship between farm performance characteristics (*e.g. days to slaughter*) and the prevalence of tail lesions of different degrees of severity. This would enable us to better estimate the cost implications of this production disease.

The high prevalence of moderate tail lesions in a high proportion of batches indicates that chronic tail biting is a much more common behaviour on farms than previously thought. The large variation between batches suggests

that there is considerable room for improvement in the management of tail biting on Irish farms. Given the economic and welfare implications of even moderate tail lesions it would benefit producers to receive information from the factory on such lesions recorded during the meat inspection process. This could help producers and advisors to keep track of tail biting on the farm and possibly intervene before chronic tail biting behaviour escalates into more severe outbreaks.

Links between management practices, health and welfare on Irish pig farms

A. Vale[1], E. Garcia Manzanilla[2], L. Boyle[2], J. Gibbons[3], F.C. Leonard[3]

[1] School of Veterinary Medicine, UCD, Belfield, Dublin 4, Ireland; [2]Teagasc, Pig Production Development Department, Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork

Irish pig production has been identified as an important sector in Irish Agriculture by Food Harvest 2020. Public demand has driven market changes compelling supermarkets and the pig industry to provide improved health and welfare standards during production. All stakeholders recognize the importance of embracing the challenge of producing animals based on a sustainable approach and now it is time to undertake the changes required to do this.

Current research projects can provide the tools to support the 290 commercial pig herds (*Teagasc, 2013*) that are striving for success by improving animal health, welfare and to increase productivity and profitability. However, it is essential to identify practices that impact different aspects of pig production, including biosecurity, disease control and welfare and that can improve outcomes for both the animals and the producer.

A questionnaire focusing on production data, dry sow management, management of growing and finishing pigs, biosecurity, nutrition, welfare, health and general information on uptake of training and advisory services was sent to Teagasc clients during 2014. The aim of this rather extensive questionnaire is to examine relationships between several factors that haven't been explored before, thus facilitating a comprehensive analysis of the problems affecting the industry and enabling us to give practical and specific advice to farmers.

In order to accomplish our goal, questions such as the following need to be addressed:

- Can frequent mixing of animals decrease profit?
- Can appropriate cleaning and disinfection protocols reduce the incidence of diseases on the farm, thus decreasing the costs associated with health?
- Can the distance to the next pig farm affect the performance of the farm?
- Can the reduction of antibiotic usage on the farm promote profit?
- Can productivity be increased by having less different veterinarians providing services?
- Can stockperson's education improve productivity?

Identifying management practices that impact pig health and welfare should prompt the delivery of solutions and stimulate productivity and competitiveness. It is suggested that including small changes in management practices can result in better health and welfare and therefore safer food.

From the 28 farmers that completed the questionnaire to-date:

- 15 different counties are represented
- 39% have more than one livestock enterprise on the farm
- 25.9% are multi-sited
- Number of sows ranges between 83 and 2900
- No pigs sold/sow/year ranges between 22 and 29.98
- No litters/year ranges between 2.1 and 2.41
- 75% have stockpersons specially trained in pig production
- 42.8% have 1 veterinarian and 17.8% have 3 or more veterinarians providing services
- 38.4% dry hospital pens before loading with animals
- 11% shower before start working

Do any of these farms represent you?

Your input into this project is essential to ensure that all farm types are represented in the results. These results will allow you to compare practices and select the most suitable ones to implement in your farm.

Let us work together to produce more, better and safer food!

Investigating the potential of the intestinal microbiota to impact feed efficiency in pigs (ECO-FCE)

U.M. McCormack[1], 2, S.G. Buzoianu[1], D. Berry[1], P. Varley[3], P. Cotter[1], O. O'Sullivan[1], G.E. Gardiner[2], P.G. Lawlor[1]

[1] Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork; [2]Department of Science, Waterford Institute of Technology, Co. Waterford; [3]Hermitage Genetics, Co. Kilkenny

Background: The intestinal microbiota of pigs has an important role to play in host immunity and nutrient digestion. Therefore, its potential to influence production efficiency cannot be underestimated. As feed accounts for >70% of pig production costs, farmers are continually looking for ways to improve feed efficiency. Dietary manipulation of the intestinal microbiota may be one way to achieve this. The aim of this study was to examine the variation in faecal microbiota profiles between pigs with good versus poor feed efficiency in order to investigate the potential of the intestinal microbiota to impact feed efficiency in pigs.

Methods: Entire litters from seven sows were housed individually, with feed intake and weight recorded at 2-week intervals between day 42 post-weaning (*pw*) and slaughter at day 139 pw. Two weeks before slaughter, pigs were selected within litter as having the best, poorest and average feed efficiency (*10 pigs per group*). Faecal samples were collected at weaning and at day 42 and day 139 pw for microbial community analysis using high-throughput 16S rRNA gene sequencing. Data were analysed statistically with significance assumed at $P \leq 0.05$.

Results: No differences in any of the faecal bacterial phyla detected were observed between pigs selected on the basis of divergent feed efficiency. However, at the family level, the relative abundance of Streptococcaceae was lower and of Campylobacteraceae was higher in pigs with the best compared to the poorest feed efficiency (*0.81 versus 2.09% and 0.63 versus 0.36%, respectively; P <0.05*). These differences were reflected at the genus level, with relative abundance of Streptococcus and Campylobacter lower and higher, respectively in the more efficient pigs (*0.80 versus 2.09% and 0.63 versus 0.36%, respectively; P <0.05*). In addition, relative abundance of Adlercreutzia was higher and Pseudobutyrivibrio was lower in the more efficient pigs (*0.000021 versus 0.000004% and 0.09 versus 0.17%, respectively; P <0.05*). However, the extremely low relative abundance of the former should be noted. In addition, relative abundance of the main bacterial phyla changed over time (*P<0.05*); Firmicutes increased between day 42 and day 139 pw, Bacteroidetes and Spirochaetes increased from weaning to day 42 pw and Proteobacteria and Synergistetes decreased from weaning to day 139 pw. A maternal effect was also seen for some of the major phyla (*P<0.05*).

Conclusions

Only two of the 98 bacterial families (*Streptococcaceae and Campylobacteraceae*) and four of the 212 genera (*Streptococcus, Campylobacter, Adlercreutzia and Pseudobutyrivibrio*) detected within the faecal microbiota of pigs with good versus poor feed efficiency differed. However, the role of these bacterial groups may be important; for example, some species of Streptococcus, most notably Streptococcus suis, are pathogenic to pigs and this genus was less abundant in the more efficient animals. Age-related changes in the faecal microbiota and the influence of the sow on offspring microbiota were also evident. Overall, the functional potential of the intestinal microbiota of these pigs needs to be investigated further in order to elucidate the role of the intestinal microbiota in feed efficiency.

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A cross-sectional study on the prevalence and risk factors for limb lesions and lameness in finisher pigs on commercial farms in Ireland

A.J. Quinn[1], L.A. Boyle[1], A.L. KilBride[2], L.E. Green 2

[1] Pig Development Department, Teagasc, Moorepark, Fermoy, Co. Cork, Ireland;
[2] Life Sciences, University of Warwick, Coventry, CV4 7AL, England

Fully and partially slatted floors are identified as major risk factors for lameness in various age categories of pigs. Both lameness and various types of limb lesions have a negative impact on pig welfare as well as pig performance. The prevalence of many of these conditions in intensive production systems is unknown. A cross-sectional survey of 68 integrated Irish pig farms was conducted to determine the prevalence and risk factors for various limb lesions and lameness in 1289 finisher pigs. One pen of finishers aged 18 weeks and one pen aged 22 weeks were examined per farm for a variety of limb lesions and locomotory ability. Limb lesions (*scratches, wounds, swellings, abscesses, calluses, alopecia, bursitis and capped hock*) were scored from 0 to 3 based on size. Locomotory ability was scored from 0 to 5 based on severity (*score ≥ 2 defined as lame*). Pen material, dimensions and other features were recorded for each pen and a questionnaire on management, health & performance factors was conducted on each farm.

The prevalence of the various lesion types and lameness were determined and risk factors for limb lesions and lameness identified. The prevalence of lesions in finisher pigs was: scratches (80.8%), wounds (25.4%), swellings (28.9%), abscesses (0.8%), calluses (99.5%), alopecia (54.6%), bursitis (29.6%) and capped hock (0.8%). The risk of scratches was found to decrease when pigs aged 18w were compared with pigs of 22 weeks. A reduced risk of scratches, wounds and bursitis was associated with pigs in partially slatted pens when compared with fully slatted pens. Pigs that were stocked at 0.35-0.7 m2/pig had an increased risk of scratches compared to pigs stocked at 0.84-3.04 m2/pig. The overall prevalence of lameness in finisher pigs was 32% and the risk of lameness increased from 18 weeks (27.8%) to 22 weeks (36.8%). An increased risk of lameness was also associated with a slat void of greater than 20 mm compared to less than 20 mm. Additionally, pigs in pens washed >4 times a year had a reduced risk of being lame. There was a high prevalence of lameness in finisher pigs however there is potential for improvement in lameness and limb lesions by modifications to flooring and management practices.

The effect of rubber enrichment device design and amount on the welfare of pregnant gilts

Keelin O'Driscoll

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

Provision of manipulable material is a legal requirement in pig production, but difficult in slatted systems. The most effective devices for reducing harmful behaviours are manipulable and destructive. Rubber devices that can be chewed and gradually wear away have been shown to be reasonably effective in reducing harmful behaviours. However, most of these have been devices that are suspended from the ceiling or wall, which don't necessarily satisfy the pigs desire to root and move material around. Recently, we carried out a short trial in Moorepark investigating the appeal of a novel floor device compared with a similar device hanging from a chain.

Both devices that were used in the trial were supplied by Easyfix™. We compared a hanging and a floor based device at different allowances (*1 or 3 devices at a time*) to see whether providing more of them has any benefits for the pig, or has an effect on the wear of the device. Thus we had 4 treatments (*hanging* × *1, hanging* × *3, floor* × *1 and floor* × *3*) which were provided sequentially over time to a group of 36 pregnant gilts. Treatments were interspersed with control periods, where pigs were provided with 3 × hanging and 3 × floor devices, so that there would not be an effect of novelty each time a treatment was applied. The experimental measures we took included wear of the devices (*weight and arm length*), animal behaviour (*no. of interactions with the devices, duration of interactions, and displacements*) and animal health (*ear and tail biting*).

During the experiment, the hanging device didn't lose any weight at all, and the length of the arms didn't shorten regardless of the amount provided. However the floor device consistently lost weight and arm length whether there was only 1 or 3 in the pen, significantly more so when there was only 1. This can be explained by the behaviour of the pigs towards the devices: the pigs had more interactions with the floor devices than the hanging ones, and each interaction lasted approx. 5 times longer. Thus the floor device appears to be more appealing to the pigs, and holds their interest for longer.

With regard to the number of devices, pigs had the same number of interactions with the floor device regardless of whether there was 1 or 3 provided. This explains why the wear of this type of device was much greater when there was only 1 provided, as this single device was absorbing the same level of activity as when there were 3 in the pen. Moreover, when there was only 1 floor device, significantly more of the interactions ended with a displacement than when there were 3, or when the pigs had hanging devices. This also indicates the appeal of the device to the pigs, as they appeared to be queuing up to use it. There was no problem with tail health in this group of pigs, but we did find that when pigs had more devices, they had less damage to the ears, so easy access to the devices could be

important to reduce harmful behaviours. We also found that there was no problem of the floor device getting dirty or trapped in the automatic feeder – in fact the device was so clean we could not score it for dirtiness, with less food stuck to it than the hanging device. Overall this floor device appeared to be more attractive to the pigs than the commonly used hanging devices, with no problems of hygiene, and very little management involved.

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Pig Development Department Contact List

Head of Department		
Name	*Telephone*	*E-mail*
Ciarán Carroll	025 42388 087 2462925	Ciaran.carroll@teagasc.ie
Research		
Name	*Telephone*	*E-mail*
Dr. Amy Haigh	025 42669	Amy.haigh@teagasc.ie
Dr. Edgar Garcia Manzanilla	025 42290 087 9614454	Edgar.garciamanzanilla@teagasc.ie
Dr Eimear Ruane	025 42410	Eimear.ruane@teagasc.ie
Dr. Keelin O'Driscoll	025 42290	Keelin.odriscoll@teagsc.ie
Dr. Laura Boyle	025 42389 087 9295364	Laura.boyle@teagasc.ie
Dr. Peadar Lawlor	025 42217 086 8214674	Peadar.lawlor@teagasc.ie
Dr. Stefan Buzioanu	025 42463	Stefan.buzoianu@teagasc.ie
Advisory		
Name	*Telephone*	*E-mail*
Dr. Amy Quinn	025 42505 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
Shane Brady	049 4338540 087 3779014	Shane.brady@teagasc.ie

Notes

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

Tel : 353 (0)25 42330
Email: PigDepartment@teagasc.ie

www.teagasc.ie

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