



Establishing R&D Priorities for the UK Pig Industry

Priorities in the Field of Pig Health

The groups divided the key areas to investigate into three main areas:

- Knowledge of a disease – knowing the pathogen and how it behaves
- Control of disease – how the disease can be treated or prevented (eg meds/vaccines)
- Disease Strategies – how the spread of disease can be reduced or prevented.

The key to success in this area was felt to be investigating the interrelationship between:

- Health
- Environment (*including environmental stressors*)
- Feed (*including gut health*)
- Reproduction
- Genetics.

It was widely felt that the identification of disease priorities may require some consultation with the industry and academics, but there was also recognition that the priority may be different for different groups. The example of this was regarding diseases such as Hep E/LA-MRSA, where the veterinary, medical and political opinion may be different. The issues surrounding 'scale of production' may also have social implications, which would need to be recognised in the face of any funding proposals and addressed. There was a suggestion that no stipulations for particular disease priorities could be an approach rather than targeting from a preferred list, but there would need to be some prioritisation if there were limited resources. Suggestions were made that disease economics was an area which should be investigated, with the effect of the disease, the cost of treatment and the cost of eradication being calculated to better inform the industry on how to approach a particular disease threat. Vaccine strategies and pen-side diagnostics were both identified as key areas.

Which Parts of the Network should be involved?

- Vet groups (eg Raft/Westpoint) - but there would have to be established communication channels out for the wider benefit of the vet profession
- Researchers
- Feed companies/nutritionists
- Geneticists
- Pathologists
- Regulatory organisations
- Pharmaceutical companies

- Diagnostic companies
- Precision livestock equipment manufacturers
- Producer groups
- Industry stakeholders
- Consumers? - there may be a need to complete the chain and communicate to the end stakeholder
- Medics – it was felt that outward communication and collaboration with the medical profession, especially around zoonotic disease could be of benefit (especially in capturing novel approaches or techniques).

There was an overall consensus that disease required all parts of the network to be joined together, as health was such a wide-reaching subject. There are potential outputs and communication which would need to be communicated out to the consumer, to politicians, policymakers and the wider public.

In addition, it was felt that the research needed to be balanced between the blue sky research/academic research and industry-led research, with a mechanism to bridge these two areas and to transfer knowledge.

Challenges/Difficulties

There was a lot of discussion in this area and comprehensive challenges were identified:

- A requirement to understand the **wants and needs** of the industry in terms of health
- A need to understand **what is currently going** on in terms of research (we don't know this!)
- **Communication** to the industry (conventional approach - do we know how to target the right approach to the right groups?)
- **Driving behavioural change/impact** - how will the research be adopted, what motivates this?
- **Social Science** - understanding of knowledge uptake (what approach is appropriate?)
- **Adoption of ideas** – what is the lag behind innovation and technical development and the industry using these developments?
- **Data accessibility and data protection** – how open can the research be to allow innovation? Not knowing what is being researched could lead to duplication or wasted funding
- **Controls on publication** – what lags in innovation are being contributed to by publication, restricting or slowing innovation
- **Commercial Sensitivities** – for example, research in the poultry sector where work is being carried out by the integrators who do not wish to communicate discoveries to the wider industry in fear of losing profits
- **Pure Vs Applied science** – 'Blue sky' research is vital, but this requires industry to be comfortable with failure, .ie no result is a result in itself
- **' Innovation Awards'** this was an idea for an approach for small proof of principle (blue sky) science, which may lead onto a larger project
- **Quality Controlled on farm research** – from the concept that on-farm research does require scientific input/staff if reliable results are required

- **Skills Gap** – there was a feeling that certain skills or roles within the industry were on an ‘endangered list’ and that the expertise could be lost if we are not careful. Examples were: Veterinary Pathologist, Microbiologist (general veterinary), Entomologist, etc. One suggestion was that there may be the need to train replacements to existing resource, possibly with international collaboration, if suitable. The development of this expertise needs to be balanced against the need in the industry and the availability of the expertise elsewhere, ie if we are willing to buy this in or not!

Other ideas put forward before/after the meeting: Clinical incidence reporting; good platform technologies to investigate new strains; surveillance for endemic diseases and new strains; see when viruses change or adapt and have vaccines to deal with it; tick-borne diseases in outdoor pigs, especially considering the change in ambient temps; next generation sequencing; feeding insect proteins to monogastrics; pen-side/rapid diagnostic testing for key diseases to inform appropriate control strategies including antibiotic use; methods of reducing pathogen loads in pig housing; novel disease control methods eg bacteriophages

Priorities in the Field of Pig Nutrition and Nutrient Efficiency

- **Variation in raw material** – two approaches to tackle this would be 1) to understand where the variation is arising from (in the field, in the process) and then try and reduce it. It is considered that the largest contribution to the ‘variation’ is due to the process, therefore we need to understand the link between amino acid digestibility and processes to get it better (process variation) and 2) to develop a rapid means of testing for the nutritional value of raw materials, (eg the availability of amino acids, energy, etc for digestion/absorption) ie to accept that variation exists but the rapid test (performed in the mill) would tell formulators of diets what is available within the raw material. There was also discussion on varying glucosinolate levels in rape – R and D demonstrated the problem but didn’t provide an answer of how to solve it
- **Improving the value/quality of the pig meat product** as well as the efficiency of feed (in other words, nutrition should be about the quality of product as well as the efficiency
- Effect of **variation on animal performance** – does it matter?
- Remove the risk from the use of **animal bi products** so they are safe to use in feed again
- **Gut microflora** – what can we learn from human medicine and, ultimately, how can we take out zinc without affecting animal performance and health?
- Improve **traceability** of raw materials
- **Gap analysis** – what do we not know about feed ingredients? While we know a good bit about wheat, barley, maize and soya, there are still things we don’t know and does variation/difference in these main products affect animal performance?
- There is a major drive from INRA to redo the ‘**feed tables**’ and, when doing so, ‘harmonise’ the feed tables that are currently in existence across the EU. However, the UK feed industry would agree that what is needed more is the harmonisation of the feed analysis methodology – there are numerous ways in which fibre, energy and so forth can be measured and especially the way the digestibility of these nutrients can be measured – what is the right or wrong way and ultimately the feed industry would like the ‘digestibility’ of nutrients tables to be produced using agreed methodology
- **Understanding variation** – what does the animal need? Can genetic problems be modified by nutrition; why does some feed perform differently?
- **Protein imports** – can they be reduced? Is it economical to reduce imports? eg would it be economically viable to re-proportion the land available for crops to grow feed (protein and energy crops) for the livestock (pig) sector – this is an economic modelling exercise. An alternative radical solution is designing a feed that is solely UK home-grown to maximise output energy/protein/ha
- **Alternatives to antibiotics**
- **Sow prolificacy** – how can some sows milk down and wean out high crate weights – could we genotype these sows and align with their phenotypic data – the sows across CIEL would generate a very strong database to try to understand the genetic/genomic basis of high milk yield – the research providers would all have detailed individual sow records.

Other ideas prior to/after the meeting: Mycotoxin testing; batch feed analysis; enzyme and minerals in batches; breed-specific nutrition; feed supplements.

Priorities in the Field of Pig Welfare

- **Perception of pain** - mutilations; lameness; ulcers; tail biting; welfare impact of disease; gut health; mortality
- **Farrowing environment** - welfare of sows and neonates; hyperprolificacy/large litters
- **People:** stockperson training; bad handling/effect of human/animal interactions
- **What is good welfare?** Evidence-based welfare; data-driven welfare; legislation; positive welfare, understanding a good life
- **Social science** - understanding consumer attitudes; educating consumer attitudes; anthropomorphism; positive welfare
- **Space allowance** - for modern genotypes; space allowance and reproductive consequence – finding a compromise.

Which Parts of the Network should be involved?

All CIEL disciplines should be involved in welfare research. 'Holistic' and multidisciplinary -in particular, the following:

- Environmental impact
- Multi criteria assessment of system consequences, eg keeping sows outside.
- Product impact – welfare effect on meat quality
- Use of modelling
- Involve a 'supply chain of disciplines'
- Embed industrial partners (but will there be a competitive 'issue' ?)

Challenges/Difficulties (of making high welfare sustainable)

- Division of funds between CIEL partners
- Potential competition between and within partners (incl. industry partners), leading to obstacles in uptake, eg:
 - Research involving 'core' welfare (mainly driven by legislation), which everyone needs to adhere to, will make dissemination easier
 - Research involving 'premium' welfare, which may lead to a competitive edge due to a product KPI. It is expected that there might be less 'openness' in such research.
- Avoidance of unnecessary duplication of research
 - Awareness of others' research
 - Avoidance of pseudoscience.
- Linking welfare to production and selling the economic benefit to producers and retailers
- Effect of investment opportunities to improve things ('investment cycles')
- Effect of divergent UK production systems and potential for uptake

- Maintain/create new competitive edge – maintaining element of differentiation of UK pork
- Difficulties of risk-based decision making (importance of social science in this)
- Continuity of funding and expertise
- Greater interest in high welfare meat but there is less money available across EU funding
- Small incremental steps are undervalued. Need to show evidence-based ‘successes’ of small steps to highlight the value. Need to manage expectations – both CIEL and researchers should manage the expectations both ways. It needs to be clear what the timescales are; what outcomes are expected; ‘robustness’ and general applicability
- Lack of economic reward and security of economic reward
- Finding standard data collection SOPs across all trial
- Managing expectations wrt research, in terms of:
 - Timelines
 - Outcomes
 - Robustness
 - General Applicability.

Both CIEL and researchers should manage expectations both ways, as well as to customers.

- We need industry to speak with one voice

Other ideas prior to/after the meeting: Use of sensor tools to improve pig welfare; welfare research that will enhance our points of difference with the EU (free-farrowing, feasible provision of manipulable materials on slats, support measures to help move away from tail docking); management of entire males in a changing production and genetic landscape; controlling vice; alternatives to CO₂ gas in terms of alternative gas mixtures (combinations of nitrogen or argon in air [nitrogen would be a lot cheaper]) or other novel techniques such as Low Atmospheric Pressure Stunning (LAPS). The latter has been developed in the US for broiler chickens and there could be potential for looking at it in relation to pigs; pain mitigation measures primarily for tail docking; euthanasia of piglets on farm; genetics of sows for use in indoor free farrowing systems; genetics for reducing aggression, and potential links with tail biting; identification - alternatives to slapmarking, eg microchips or similar, taking into account the need for a device that doesn't migrate and that more and more of the pig is used these days (ie risk of contamination in food); space requirements for heavier pigs - legislation only goes as far as 1m² for pigs >11kg. With pigs being taken to heavier weights, perhaps this needs to be looked at, especially given that >110kg per m² seems to be an important figure for increasing the risk of tail biting; longevity; welfare at transport; on-farm killing; welfare impact of new genetics; feedback from processors.

Priorities in the Field of Pig Meat Quality and Safe and Traceable Pork

- **Education for consumers**
 - Educating on the importance of factors such as cooking time as well as temperature
 - Is there a general lack of interest to learn about cooking? Do most people opt for convenience instead?
- **Making pork fashionable**
 - Why isn't pork as popular as chicken?
- **Social research attitudes and actions**
 - What do consumers want, eg what is 'quality'?
 - Address the main turnoffs for Pork, eg toughness and odour; variability in taste/cooking. Is boar taint still an issue? Look at technology to make pork more succulent and flavoursome; reintroduce marbling to combat dryness; reintroduce back fat into muscle
 - What do different consumers need in terms of nutritional requirements? Advertise the health benefits of pork.
- **Maintaining welfare**
- **Focus on every step of pork production and balance multiple factors**
 - Disease resistance vs quality
 - Take a logistical approach.
- **Improve quality**
 - Without adding additional costs to the farmer.
- **Improve technology used for traceability**
 - Further traceability beyond the farm (eg look at feed)
- **Safety**
 - Which diseases pose the greatest threat and when are risks highest?

Which Parts of the Network should be involved?

- **The whole supply chain**
 - Everything from feed through to consumer
- **Social researchers**
 - Understand the barriers and differences in consumer patterns
- **Abattoir network**
- **Retailers and Processors**
 - Improve communication with them without threatening the competition
- **Technology**
 - Traceability

- Genetics – quality (rare breeds)
- **Nutrition**
 - Impact on quality
- **Research**
 - Academic and processors
 - Identifying intervention points and contribution

Challenges/Difficulties

- **Identifying Key Points**
 - What points in the chain have the biggest impact on quality and how can we optimise these?
- **Changing Consumer perspectives**
 - Follow on from the success of the Pulled Pork Campaign
- **Funding**
 - Very few funders
 - Encourage retailers to contribute more money
- **How do we make British pork special in relation to global improvement?**
- **Lack of facilities**
 - Meat quality facilities disappearing
- **Measuring Quality**
 - Quality of batch vs quality of individual products
 - Trade-offs between traits, eg carcass size vs boar taint
- **Welfare**
 - Aggression and behavioural problems.

Priorities in the Field of Pig Genetics

- Links between **field performance and genomic information** from the field*
- Phenotype **data** and metadata (metadata being all the other data around measurements that may have implications on interpretation of the data, eg house not full, so requiring more feed to maintain temperature)*
- **Data standards** to be kept in the centre: how data is to be recorded, so that use (benchmarking or for genetics) with different software is comparable, eg. NZ dairy example <http://www.farmdatastandards.org.nz/>
- Population scale **disease prevalence***
- **International Collaborations**
- **Disease resistance** – respiratory and coli
- **Resource efficiency** – FCR and protein*
- **Economic traits**
- **Meat quality**
- **Novel proteins** including algae and insects as a feed stock
- Use of **sensors** in general.

Which Parts of the Network should be involved?

- Bring together geneticists as well as nutrition and animal health companies and, to a lesser extent, crop scientists
- Need to involve the wider supply chain including retailers
- Need to do some economics with key data from the chain: what is the economic benefit?

Challenges/Difficulties

- Data standards/collection: incompatibility
- Metadata: often not collected at the same time. Sensors provide a useful addition*
- Regulation/legislation
- Ownership of data
- Ethical acceptability
- Turning into practical application*

(* are priorities)

Other ideas put forward before/after the meeting: Breeding for improved carcass utilisation; the need to focus on UK priorities that don't get covered elsewhere in the world, eg seasonality, and research that delivers improved efficiency to farm to make

the industry cost competitive vs EU; improving finisher efficiency in straw yards; genetics of sows for use in indoor free farrowing systems (already being considered), genetics for reducing aggression, and potential links with tail biting; optimum feeding of gilts during development; utilisation of new genomic technologies to supply livestock resistant to specific diseases

General comments made prior to/after the meeting:

Apart from outdoor pig production, I still feel there is a vast amount of research work done in other countries that we can make use of. The work may not be 100% UK relevant but it will allow us to start higher up the ladder, that is primary research to farm gate

I doubt pig farmers will ever feel they get value for money out of research as we (farmers) are generally slow adopters of innovative ideas. Not sure if this is through the lack of overall understanding of the research, how to put it into practice or cash restrictions?

It can't be just more prolific genetics that allow mainland EU pig producers to stay in business at SPP less 25p/kg. How do their economic pig production models work?

It is important to attract some new guys into pigs at all levels, nutritionists and stockpersons.