



**Research (R), Development (D) and Knowledge  
Transfer (KT) dimensions**

**of the**

**British Pig Executive**

**Health and Welfare Strategy for the pig herd**

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## Introduction: The pig health and welfare platform

This paper considers, at **strategic** level, the research, development, and knowledge transfer requirements for delivery of the BPEX plan for pig health and welfare in Britain. As such, it follows through the initiative laid in 2004 by BPEX, MLC, NPA, and PVS, which identified nine areas of priority;

- Create a Health and Welfare Council (created in 2004)
- Establish health & disease status (BPHS, NADIS)
- Communicate disease surveillance information to industry
- Intervention studies on control/eradication & Technology Interaction
- Biosecurity
- Tackling new diseases
- Risks/consequences of emerging pig issues
- Training farmers and specialists
- Targeted pig research

Behind the strategy here described lies the BPEX long-term **vision** for:

- Reductions in (i) energy usage per kg meat purchased, (ii) environmental and carbon foot print, and (iii) nitrogenous losses and emissions
- Improvements in (i) pig welfare, (ii) food quality, (iii) food safety, (iv) food security, (v) export markets, and (vi) competitiveness
- An operational framework that can (i) prioritise and confront diseases afflicting the pig industry (ii) identify ‘new and emerging diseases’ and (iii) give early information on ‘public health challenges’.

This vision can only be attained if there is a strategy to achieve, and to maintain, health in the British pig population.

The main body of the paper deals with those *core health strategies* directly addressing the health-related problems in the British pig herd. These are grouped under headings of Management, Eradication, Surveillance: British Pig Health Scheme, Surveillance: National Animal Disease Information Service, Veterinary medicinal products, immunologicals, and feed ingredients with suggested potency for improving health and welfare, and Specific causal agents and causal forces of disease. Also presented are *supporting health strategies* without which the *core strategies* could not be delivered. These relate to matters of Welfare, Veterinary training, Training in husbandry skills, Zoonoses, Exotic diseases, and Farm level planning and environmental sustainability. Recommendations are divided into ‘*core*’ and ‘*supporting*’. Both *core* and *supporting* strategies will need to be addressed.

In all levels of the BPEX Health and Welfare Strategy the role of the Pig Veterinary Society is seminal, and the strengthening of a joint BPEX/PVS approach will be essential to delivery of the Strategy. Necessarily, much of the strategy is formulated on the identification of ‘gaps’. With effective action some of these will close, and others may open; thus the strategy will require to be revisited in the course of its expected five-year term.

The strategy addressed here will create the platform from which can be taken forward **action plans**. The Executive, and the recently appointed Pig Industry Development Team seeks a broad and joined-up input from stakeholders, Government and the EU as it develops these action plans to achieve a real improvement in the health status of British pigs.

## Executive summary

The BPEX Pig Industry Development Team plans to take forward the BPEX Health and Welfare Strategy with the support from the full spectrum of funders and stakeholders.

### ***Core health strategies directly addressing the afflictions of the British pig herd***

1. *Management* Biosecurity dictates the likelihood of disease entry and therefore merits a major part of the effort to deliver to pigs an improved health environment. Husbandry and nutrition modulate disease impact and facilitates the immune response; but the most cost-beneficial disease amelioration strategy will be through genetic selection for disease resistant genotypes. Pig producers should be rewarded for ‘good stewardship through biosecurity improvements’, as in other sectors of agriculture through support schemes.
2. *Eradication* Knowledge Transfer, Demonstration and Development effort could, with agreed national effort, eradicate a number of diseases presently accepted as endemic. These include pneumonias (APP, PRRS, possibly enzootic pneumonia), mange, and dysentery.
3. *Surveillance (BPHS and NADIS)* These schemes can deliver disease monitoring, early warning and health management, and support eradication and Quality Assurance. However, they require improved implementation and interpretation. There is a need for closer co-ordination of these schemes with VLA Surveillance.
4. *Veterinary products* Disease amelioration may be achieved by anti-infectives, vaccines, analgesics & anaesthetics, and products supporting animal response to disease challenge. Particular contributions can be made through development of diagnostic techniques (including the assessment of pathogenic virulence) and multi-valent vaccines.
5. *Specific causal agents and causal forces of disease* Relatively few specific disease organisms account for major disruption of the pig industry. These organisms are open to direct targeting through management, eradication or vaccination. Present attention is centered upon PMWS, PRRS, the pneumonia complex, *Brachyspira* and *Lawsonia*.

### ***Supporting health strategies without which the core strategies could not be delivered.***

6. *Welfare* Disease-related welfare of pigs in the UK is well addressed by the agencies presently involved. Knowledge Transfer effort will remain high. R&D priority must focus on pig needs, such as mutilations, problems related to tail biting, transportation distances, and the husbandry of entire males at weights above 80kg.
7. *Veterinary training* Positive action involving government, educational and professional bodies is required to resolve the shortage of trained pig specialists. At the heart of any policy must be the funding of pig-orientated applied research in University Departments.
8. *Training in husbandry skills* Appropriate husbandry for pig health can only be delivered by trained staff. New initiatives are proving effective and should be extended with direct inputs from those involved with Knowledge Transfer.
9. *Zoonoses* The priority is to improve the ZAP scheme. There is a need to formulate effective Zoonosis National Control Plans (ZNCPs) for UK pig populations. New R&D approaches should include analysis of actual risk, the value of vaccination, and effective interventions on units with high *Salmonella* prevalence.
10. *Exotic diseases* Responsibilities for identifying and coping with the incursion (or re-incursion) of exotic disease must be shared amongst the interested partners.
11. *Farm-level planning for pig health and environmental sustainability* The Defra Sustainable Farming and Environment agenda is seen as integral to the delivery of the Health and Welfare strategy; avoidance of conflict between these two imperatives being essential. Farm Health Planning is part of environmental protection; embodying forward planning and a HACPP approach to the avoidance of health collapse.

## Core Health Strategy Recommendations

1. Achievement of understanding of interactions between endemic diseases and the pig's internal & external environments
2. Initiation of national programmes for the eradication of pneumonias
3. KT initiatives for the strategic amelioration of PMWS through holistic health and welfare strategies
4. Development of diagnostic techniques that discriminate closely related pathogens with differing virulence (such as in *A. pleuropneumoniae*)
5. Development of vaccines
6. Understanding virulence and epidemiology of *Brachyspira sp.* and *Lawsonia sp.*
7. Research into, and application of, purposeful genetic selection for disease resistance
8. Development of analysis, interpretation and coordination of BPHS, NADIS and VLA disease and health monitoring data in order to deliver more effective management information, surveillance, early warning and eradication.

## Supporting Health Strategy Recommendations

1. Quality Assurance to continue to move toward assurance of best practices and environmental sustainability
2. KT to address inadequacies in Biosecurity
3. Management of exotic disease risk
4. Measurement and amelioration of sub-clinical disease
5. Reduction of transportation distances to slaughter
6. Reduction of the incidences of (a) tail biting, (b) male abusive behaviours and (c) lameness
7. Addressing the conflict between sow and piglet welfare post-farrowing
8. Determination of effective interventions to reduce/eradicate *Salmonella* from producer units and processor plants, including the utilisation of vaccines for *Salmonella* control
9. Support to secure development, improvement, interface/integration and usefulness of BPHS, NADIS and VLA surveillance systems
10. Development and independent testing of commercially available vaccines, anti-infectives and other pre-medicinal products offering disease amelioration or prevention
11. Implementation of reward schemes for 'Good Stewardship' contribution to environmental enhancement through, biosecurity improvements, disease control and membership of health schemes
12. Delivery without conflict of the Environmental and Health & Welfare policies
13. Placement of research funding in Universities veterinary, animal science and environmental schools in order to (a) address this Health and Welfare agenda and (b) encourage graduate career development in the Pig Industry
14. Further development of the working relationship between BPEX and PVS
15. Closer cooperation and coordination with other EU countries in relation to their health programmes

# **Core Health Strategy**

**Management**

**Eradication**

**Surveillance: British Pig Health Scheme**

**Surveillance: National Animal Disease Information Service**

**Veterinary medicinal products, immunologicals, and feed ingredients with suggested potency for improving health and welfare**

**Specific causal agents and causal forces of disease**

## Management

*Husbandry* Endemic disease is more readily controlled, and the effects of disease more readily ameliorated or nullified, in units that are well managed. The blue-printing of effective management practices is of high priority. Unfortunately, the study of the interrelationships between management (nutrition, housing, and breeding) and health is neither easy nor charismatic. Its neglect however must be reversed if the health of the UK pig herd is to improve, and disease incidence controlled. This will require (a) a change in the direction of research funding policy and (b) support for training in husbandry and on-farm animal surveillance.

*Farm quality assurance schemes* Farm assurance certification can offer a route to effective management of endemic disease. Together with Pig Health schemes, Certification can provide both (i) the management protocols to ensure the monitoring and limitation of disease, and (ii) the means to inspect the satisfactory delivery of those protocols. As the driver for QA is the retail sector, the involvement of processors and retailers in improving the health of the UK pig herd is paramount. For farm assurance to accept this developed role, it would benefit from incentives to move toward the promotion of best practice.

*Nutrition* Level of feeding (through hunger and satiation) and the balance of nutrients in feed are primary forces influencing the likelihood of incidence of disease. In the event of overt disease, the quality of nutrient provision will influence the severity of an outbreak, and the significance of its consequences. Macro and micro dietary components also help to support immuno-competence and counter-challenge to disease agents.

*Genetics* Genetic selection has often been biased (in retrospect, unhelpfully) towards production traits, and taken place under conditions of good management and low disease challenge. This may have led to lowered disease resistance. There would therefore be benefit in genetic selection programmes that purposefully weighted traits that supported disease resistance and physical competence. Genetic interactions influence predisposition to (a) ill health in general and (b) the ability to resist specific disease organisms. Although little is understood of the mechanisms, there is evidence that certain genotypes offer relative resistance to diseases and syndromes causing mortality and morbidity in early life (E coli, PMWS, Glasser's disease). It is therefore essential to conserve gene pools of potentially useful breeds for resistance to new health risks coming forward. This suggestion accords with The (2006) National Action Plan on Farm Animal Genetic Resources, which recommends action on the characterization of breeds with regard to disease resistance, fitness and physical competence.

*Biosecurity* Best practice (visitor and vehicular control, rodent control, pig importation limitation, lateral & vertical infection control) is known, but usually not implemented; despite the obvious benefit of preventing causal disease organisms entering production and processing units in the first place. A substantial Developmental, Demonstration and KT initiative is required; possibly with "Good Stewardship" rewards for contribution to environmental enhancement through disease control. Certain diseases (such as PRRS, mycoplasma and actinobacillus pneumonias, *Haemophilus parasuis*, Lawsonia), presently endemic, are open to eradication (at unit, regional or national level), but this can only happen if biosecurity measures are in place to prevent re-infection.

## Eradication

Endemic disease reduces performance and increases costs. Mortality and morbidity rise with clinical pathogenesis. Medication is not only costly; it also risks resistance and residues in carcasses and in animal wastes. A high level of national herd health will move diseases from being endemic to becoming eradicable. Disease eradication, at both farm and national level is a policy issue with high cost; requiring the contribution of all stakeholders. As major competitors move towards eradication of specific diseases, it is necessary for the British pig industry to have similar goals.

The actual and perceived causes and incidence of endemic disease in pigs in UK are constantly changing and have been influenced in recent years by:

- Intensification of indoor production, increased herd size & scale of operation, multi-site production, outdoor production
- The arrival of porcine respiratory coronavirus (PRCV) infection in 1986, porcine reproductive and respiratory syndrome virus (PRRSV), and swine influenza virus (SIV) in 1991, and the emergence of post-weaning multisystemic wasting syndrome (PMWS) / porcine dermatitis nephropathy syndrome (PDNS) in 1999
- The "respiratory and enteric disease" complex in weaned and growing pigs
- The emergence of *Salmonella typhimurium*
- Improved understanding of colitis & identification of spirochaetes, and of porcine proliferative enteropathy & identification of *Lawsonia intracellularis*
- The introduction of *Escherichia coli* and *Mycoplasma vaccines*.

Blueprints and methodologies for farm-specific disease eradications at economic cost require to be optimized for diseases such as enzootic pneumonia (EP), PRRS (especially), *Actinobacillus pleuropneumoniae* (APP), swine dysentery (SD), streptococcal meningitis, and *Lawsonia* ileitis. Many pig disease organisms have both pathogenic and non-pathogenic strains (APP and SD). Diagnostic techniques which allow differentiation are therefore essential if livestock are to be screened, and infective organisms eradicated.

There is a growing interest internationally for area-based eradication of endemic pig diseases, principally EP and PRRS. A number of countries including Denmark and Finland have specific pathogen free systems that permit trade in certified pigs. Switzerland has a national EP eradication programme. In Britain there has been an eradication strategy at herd level that has extended to surrounding herds where agreement can be reached. In spite of occurrence of EP outbreaks in eradicated areas, the current status of the area-wide eradication is promising, and a further decline in incidence of EP infection can be achieved in the future. The American Association of Swine Veterinarians has adopted a position statement supporting the goal of eliminating the PRRS virus from North America. A PRRS Eradication Task Force has been formed. In UK, NADIS reports suggest that respiratory disease is the commonest cause of ill health, followed by PMWS/PDNS. Of the enteric diseases, colitis/ileitis and coccidiosis appear important. The importance of organic production systems to our future market place position emphasizes the need for disease control by management and by eradication.

## **Surveillance: British Pig Health Scheme**

The recently introduced BPHS is a membership-based monitoring and reporting scheme giving feedback to producers from the abattoir on the health of their pigs. It follows on from the pilot 'Wholesome Pigs Scotland', completed by SAC in 2005, in which quarterly veterinary inspections of carcass and viscera were performed, and the information sent to producers and their veterinarians within three working days of the inspection. WPS attracted 95% of Scottish herds.

The BPHS monitors carcasses at abattoirs for the prevalence of enzootic pneumonia-like lesions, hepatic scarring, peritonitis, pericarditis, pleuropneumonia-like lesions, papular dermatitis, milk spot liver (ascariasis), pyaemia, pleurisy, other lung lesions, tail-bite lesions, and abscessation. The scheme does not identify causal organisms, but these may be inferred by practitioners and confirmed by on-farm visits. Members are informed of the relative importances and financial consequences of the various conditions to their pig unit, facilitating management of pig health.

The Scheme also lends itself to the accumulation of data over time and place, giving the trends in health conditions for individual units, allowing bench marking with other like production units, and the building up of regional and national data of disease prevalence (preliminary analysis from WPS indicates some half of Scottish pigs had lung lesions consistent with enzootic pneumonia, and some quarter had levels of papular dermatitis consistent with sarcoptic mange).

The BPHS is presently receiving strong BPEX support (one third; another third is met by Defra, and the remaining third from commercial sponsorship and membership fees). Membership covers about 60% of certified pigs in England and Wales, but for effective operation as part of a National Pig Health Scheme, membership should be compulsory for pig certification through Farm Quality Assurance Schemes, and producers could be supported in achieving this goal by appropriate "Good Stewardship" incentivisation.

There would be substantial benefit at both farm and national level of connecting together BPHS which deals with the health of pigs at the point at slaughter, and NADIS (see below) which deals with the health of pigs as they progress through the on-farm stages of production.

The BPHS and NADIS initiatives will be central to the effective implementation of any UK disease eradication plans. In addition, however, there is a need for cost-effective diagnostic tests. The cost of tests limits their uptake, and this contributes to delays in identifying the entry of disease conditions onto pig farms. It is evident that compared to the US, the UK industry has a substantially more costly and less wide-ranging set of diagnostic tools at its disposal.

## **Surveillance: National Animal Disease Information Service**

NADIS has been funded by BPEX to monitor and identify diseases that are currently causing problems in the pig industry and provide advice to pig farmers on causes, diagnosis, and treatment. NADIS encourages early disease detection and prevention. Present emphasis is upon; EP, APP, mixed respiratory disease, PMWS/PDNS, SD, colitis/ileitis, coccidiosis, mange, PRRS, meningitis, and colibacillosis.

A surveillance element is delivered by a national network of veterinary practices, reporting on the diseases that are evident on pig units at the time of their visit. The primary data are specific to the farm visited and the veterinary practitioner visiting. At this level the scheme is of value by providing a 'best practice' template for farm health monitoring. Repeat reports through time give a picture of both level of disease occurrence on the unit, and changes over time in the relative frequency of observation of specific diseases; in both absolute and comparative terms. This allows managers to take immediate action in disease control, and forward action in disease reduction and prevention. NADIS data however do not inform on the proportion of the herd afflicted at some time or another in the life of the pig, nor of the impact of the disease upon efficiency of production. BPHS reports (see above), combined with NADIS information, will give some measure of the degree of affliction within a herd, but further work is needed for safe quantification of impact.

Pooling, collation and appropriate analysis of data collected through the NADIS scheme can be used for wider regional and national purposes: (a) knowledge of relative importance of different diseases in the UK pig herd, (b) surveillance for increasing incidence of existing diseases and (c) early detection of the emergence of any new disease that may threaten the pig sector in the future. For this element of the scheme to be taken forward to assist in the management of national pig health improvement programmes, fuller epidemiological interpretation of the data is now required. This will be a non-trivial task, and one which may mean investment in practitioner training to achieve consistency of reporting and interpretation across farms, vets and regions. NADIS should be taken forward in this way through R, D and KT support.

Both BPHS and NADIS have potential to contribute to broader veterinary surveillance by provision of quantitative data for Defra's central surveillance systems. Importantly however is the bringing together of the knowledge streams from these two schemes with the excellent and comprehensive service provided by VLA Surveillance.

## **Veterinary medicinal products, immunologicals, and feed ingredients with suggested potency for improving health and welfare**

It would be wrong to assume that these areas of interest can be left solely to the pharmaceutical and nutritional industry sectors manufacturing product for the market place. Accurate diagnosis is prerequisite to action against disease taken by any sector. Further development of multi-valent diagnosis for ranges of related organisms is sought.

Disease reduction is dependent upon basic science host-pathogen interaction studies aided by fundamental understanding of disease pathogens and their relationships with their hosts. Host pathogen interactions, and an understanding of these at gene expression level may enable new approaches to anti-infectives, and a reduction in use of medicines. Such studies will elucidate cross-talk between host and pathogen as a potential route for new anti-microbial, anti-infective, and anti-colonisation strategies. These would target most of the main enteric and respiratory pathogens where effective vaccination is not available. These basic science issues are best addressed by independent scientists.

Development of vaccines and their delivery systems is seen as a long term goal for pig health improvement. Development of vaccine technologies should be led by the pharmaceutical industry, but sufficient investment can only be encouraged if uptake were to be backed by national schemes. The industry seeks the development of multi-valent vaccines addressing groups of related organisms (such as for lung diseases). A joint approach between the production industry, HMG and the pharmaceutical industry should be implemented, although it is likely that, given the cost of meeting regulatory requirements in drug and vaccine development, collaboration at an international level may be necessary. The slow rate of vaccination approval for the UK remains an issue.

A significant reduction in the use of pharmaceuticals can be achieved by improved production management. Thus methodologies for the effective use of low level pre-medicinal and immunological products should be bench marked, and demonstrated. Amongst these are specific macro and micro feed ingredients. These may go under a variety of descriptors, but are characterized as natural or near-natural products which (a) may have beneficial effects at physical or physiological levels in the body, or (b) may counter agents challenging pig health, or (c) may alleviate the effects upon the body of disease agents, or (d) may provide background support for the immune system (for example by stressor reduction). A present problem with many such products is that their beneficial properties remain unproven. Testing of efficacy is best delivered through authorities independent of commercial interest.

## Specific causal agents and causal factors of disease

Multi-factorial disease complexes that result from the interaction of disease organisms with environmental quality, standards of management and pig factors, are now of greater importance in the UK than specific disease agents. Multi-factorial respiratory disease is probably responsible for the most significant economic effects, followed by multi-factorial enteric diseases.

PRRS and PMWS/PCV2 continue to be the main causes of pig morbidity and mortality.

Disease challenges are particularly significant for the industry in the immediate post-weaning period, as exemplified by PMWS/PDNS, which is currently the most important disease affecting pig welfare and pig productivity. PMWS has so far proved difficult to eradicate, but it is closely associated with prevailing husbandry practices. Thus, PMWS needs to be addressed within a wider pig health and welfare research strategy. With regard to enteric disease, a major challenge is to improve the understanding of mucosal immunity and the establishment of a stable gut microflora in the post-weaned pig that improves the capacity to resist colonization by pathogens and zoonotic microorganisms.

There is substantial evidence from BPHS and NADIS that lung disease remains the major cause of efficiency and welfare losses in British pig herds. There is agreement that addressing the complex of organisms involved, and the factors affecting their virulence is a matter of urgency. Respiratory disease is a reflection of the viral and or bacterial challenge, the environment, and the genetics of the host. The BPHS data seems to be indicating that lungs are the most commonly afflicted organ of the slaughter pig, with 70% of pigs suffering some level of lung condition. BPHS has identified pleurisy as a major cause of processor inefficiency and is a direct indicator of substantial production performance losses. A range of agents may be involved; the most important of which are PRRS, Swine Influenza, PCV-2, *Actinobacillus pleuropneumoniae*, *Mycoplasma hyopneumoniae* and *Haemophilus parasuis*. *Mycoplasma hyopneumoniae*, *Actinobacillus pleuropneumoniae*, *Bordetella bronchiseptica* and PRRS virus are open to control by eradication. *Haemophilus parasuis*, *Pasteurella multocida* (and *Streptococcus suis*) are open to preventative or curative measures, but success is variable.

The main organisms responsible for enteric disease in growing and finishing pigs are *Brachyspira* spp. and *Lawsonia intracellularis*. *Brachyspira pilosicoli* and *Brachyspira hyodysenteriae* are open to control by eradication. Present priorities for *Brachyspira* relate to factors influence virulence. Better understanding of the epidemiology of *Lawsonia intracellularis* (and *Salmonella* spp.) may also open this agent to eradication but efforts so far have focused on preventative or curative measures with variable success.

The major parasitic infections are coccidiosis (*Eimeria* and *Isospora* spp) in the young pig, *Ascaris suum* in the growing pig and sarcoptic mange in sows. While techniques exist for the eradication of sarcoptic mange, control of ascaris is more variable. Initial BPHS data indicate that there is ample room for improvement in the control of these latter two diseases.

# **Supporting Health Strategy**

**Welfare**

**Veterinary training**

**Training in husbandry skills**

**Zoonoses**

**Exotic diseases**

**Farm level planning and environmental sustainability**

## Welfare

Ill health remains the major cause of reduced welfare in the UK pig herd. Clinical manifestation of disease self-evidently creates a cataclysmic loss of welfare, and the addressing of disease is seen as the main thrust of the strategy to deliver welfare.

Sub-clinical disease however also exercises an insidious negative effect upon welfare, which may persist on units as an aftermath of clinical infection, or as an on-going endemic of a noxious cocktail of diseases, none of which reach clinical level. The consequences of sub-clinical disease are (i) a substantial reduction in efficiency of feed use and reproductive rate, (ii) an increase in environmental pollution that results from nutrient expenditure fuelling the immune response, and (iii) a reduction in animal comfort that is unacceptable. Whilst the extent of sub-clinical disease in the UK pig herd may be inferred from breeding and growth performances below bench mark, there is little objective knowledge at either national or herd level. This absence of evidence disallows rational decision-making to formulate policies and actions to reduce the incidence of sub-clinical disease. Given the present poor performance of the UK herd in comparison to competitor countries, and general acceptance that sub-clinical disease contributes substantially to this, R & D and KT programmes to address sub-clinical disease are a matter of urgency.

Ill health aside, the standard of welfare under which UK pigs are kept is generally regulated by Statutes (HMG and EU), Quality Assurance Standards (ABP/Genesis), independent Guidance Codes (FAWC), and HMG Codes of Recommendations for welfare of Livestock. Given adequate representation, these agencies will continue to ensure control of the way UK pigs are accommodated and cared for. There should be continued support for initiatives and controls which ensures that UK pigs are kept under welfare standards that are (a) world leading and (b) under constant review by these bodies. However, it is of paramount importance that, whatever the source or type of the guidance, a sound evidence base incorporating science, best practice in husbandry and socio-economic considerations will always be used to guide legislation, codes and welfare codes and that excessive rigour is not imposed in the implementation of guidance for welfare.

The Strategy will support pig welfare development in the following general areas: Stockworker skilling; Tail biting/tail docking; Group size/space allowance; Outdoor/organic systems; Abusive behaviours by entire male finishing pigs; Stress/disease interrelationships; Transportation/journey length, lairage, and slaughter; Restraint/pig protection (particularly the conflict between sow and piglet welfare post farrowing; Indoor systems; Welfare indicators/markers for present and previous welfare challenge; Lameness; Parasitic infections; Environmental enrichment.

For all of these, Development, Demonstration, Training and Knowledge Transfer (rather than basic research) are seen as the priority need. This is because basic knowledge (with the exception of tail-biting, stress and abusive behaviours by males) is adequate for application, while it is the incorporation of applications into working systems that requires further effort to give the industry base support in knowledge emplacement.

## Veterinary training

Teaching in pig medicine and health management on undergraduate courses at the UK veterinary schools has been marginalized in recent years. However, the need for a body of specialist pig veterinarians is now greater than ever before because of:

- The importance and increased awareness of food borne zoonoses and of animal welfare
- A contraction in the body of expertise on pig health and production resultant from the loss of animal science skills, previously provided through (now diminished) university programmes in agriculture and animal science
- The increasing role of the veterinarian in farm and abattoir level Quality Assurance

Paradoxically, while numbers of undergraduate students following veterinary degrees has increased, those exiting with specific interest in pig health and welfare have dwindled. This decline has been paralleled by a loss of pig health research scientists at veterinary schools. For an effective Health Strategy there are particular issues with the training of veterinarians in; (i) Pathogen dynamics and epidemiology, (ii) Clinical research, (iii) Pathology, and (iv) Numerical and statistical skills, and importantly (v) The study of the interrelationships between disease and animal husbandry, and (vi) Communication skills to drive change at farm level.

HMG, the UK Pig Veterinary Society (PVS), larger specialist pig veterinary practices and the VLA are, together with the tertiary education sector, central to generating a recovery, through training, of pig veterinary practitioners and research workers.

The following routes for delivery of training will be actively encouraged:

- Core undergraduate teaching.
- Practitioner-orientated Continuing Professional Development:
  - Pig Veterinary Society meetings
  - John Walton training days
  - Animal Health Company product launches
  - Disease review sessions
  - Training delivered by the State Veterinary Service, beyond the current provision of basic Local Veterinary Inspector (LVI) training to cover; (i) Contingency planning and (ii) Emergency and disaster management.
- Specialist clinical training:
  - Training for the RCVS certificate and modules in pig medicine
  - Training for membership of the European Colleges of Pig Health Management (ECPHM) and Veterinary Public Health (ECVPH)
  - Clinical Residency training programs in pig medicine.
- Research training initiatives:
  - Defra Veterinary Research and Training Initiative (VTRI)
  - Clinical research training outreach programs for practitioners
  - Post-graduate research studentships in pig veterinary sciences.

Given that research is the primary driver for UK Universities hosting Veterinary Schools, it is self evident that the present unacceptable position can only be addressed by a flow to the Veterinary Schools of research funding targeting pig industry issues. A coordinated national strategy for potential funders and policy makers would be beneficial.

## Training in husbandry skills

Front-line identification of welfare and disease rests with the person caring for the animal. The same person is also often responsible for the delivery of welfare and health solutions. Presently, the pig industry training strategy recognizes the need to attract and retain highly skilled and motivated staff. BPEX has linked with Defra, Lantra, National Pig Association, Agricultural Development in the Eastern Regions, Agskills and Veterinary Practices to develop a pig industry training strategy with the objectives of:

- Developing a skills and qualifications structure that is relevant to industry needs, accessible at all levels, and flexible in structure
- Providing and promoting an attractive environment for a career in the pig industry
- Promoting skills development as central to business improvement.

The recently launched BPEX Certificates of Competence Qualifications in Pig Husbandry for producers in England and Wales are designed by pig producers and are practical, relevant, and can be delivered and assessed within the workplace.

The training units are available in three packages:

1. *Basic stockmanship and welfare principles*  
Principles and practice of basic stockmanship and welfare
2. *Certificate of competence in Pig Husbandry Skills*
  - a. Safe use of veterinary medicines  
Safely Store and Administer Veterinary Medicines - Practices  
Principles of Storing and Administering Veterinary Medicines
  - b. Breeding herd operations  
Mating Management & Care of the Boar  
Dry Sow & Gilt Operations  
Farrowing House Operation and Care  
Operation of an Outdoor Farrowing Unit
  - c. Weaner, grower and finishing operations  
Weaner & Grower Operations  
Finishing Pig Operations
  - d. Associated skills  
Operation of Controlled Environment Pig Buildings  
Spreading of FYM & Slurry
3. *Certificate of competence in Pig Supervision and Operation*
  - a. Certificate of competence in planning & supervising the safe use of veterinary medicines  
Plan the Safe Use and Storage of Veterinary Medicines  
Principles of the Animal Health Management Plan
  - b. Certificate of competence in pig unit supervision and operation  
Supervising Pig Welfare  
Semen Collection & Processing  
Interpretation of Pig Records  
Management of farm waste and control of pollution  
Feed Storage, Milling & Mixing  
Selection of Stock for Future Breeding  
Organisation of Sales & Purchases

## Zoonoses

Food safety is impacted by the carriage of infective organisms originating in the pig population through to the human food chain where, if not neutralized, they threaten human health. Of primary concern in the UK pig herd are endemic infections of *Salmonella* and ubiquitous *Campylobacter* species. The threat to pig health is generally low, but the perception of a threat to consumers is high. Current legislative emphasis is placed on *Salmonella*. The EU Zoonosis Regulation (EC 2160/2003) requires Member States to determine baseline *Salmonella* prevalence, to agree targets for reduction, and to formulate Zoonosis National Control Plans (ZNCPs). Detection of *Salmonella* by faecal cultures indicates a prevalence of around 20% in UK slaughter pigs. The frequency of *Salmonella* detection on pig carcasses is lower (about 5%), but widely variable. The presence of organisms on pig meat is perceived to lower food wholesomeness, and their reduction is a priority. The Zoonoses Action Plan (ZAP) Salmonella Programme was launched in 2002. Farms potentially the cause of greatest risk to food wholesomeness are identified at the abattoir. Farm Quality Assurance Certification requires these producers to reduce salmonella prevalence in their herds. Farm identification has proved successful, but implementing reduction protocols has proved more difficult; the organism proving intransigent.

Determining the probability and magnitude of occurrence of a zoonotic risk is made difficult by (i) lack of information on the real contribution of pig derived zoonoses to human disease; the relationship between *salmonella* in pigs and *salmonellosis* in humans being inadequately described, and (ii) the unknown impact of other factors (such as other enteric disease) on the prevalence and level of shedding of zoonotic organisms.

Risk to consumers may be reduced by:

- *Optimised detection and surveillance*: appropriate diagnostic methods standardized across EU; identification of baseline and real-time prevalence in UK pigs; and risk assessment of new or emergent zoonotic threats
- *Best practices in on-farm controls*: minimising *Salmonella* prevalence by better understanding of infection dynamics within and between discrete pig populations; identifying risk factors and control points in different environments for *Salmonella* and/or *Campylobacter* shedding; employing feeding strategies that promote gut conditions unfavourable to salmonella; using blue-prints for disinfection of premises; maintaining robust general health and high productivity; and compliance with Farm Quality Assurance Schemes
- *Minimised contamination at processing*: Hazard Analysis Critical Control Point (HACCP) plans at slaughter and processing to minimize carcass contamination, together with demonstration of optimised carcass decontamination techniques
- *Consumer education*: cross contamination, inappropriate storage and insufficient cooking of animal derived foods
- *Vaccines*: Development of vaccines and vaccination strategies for *Salmonella* that can be used within EU-required surveillance programs.

## Exotic diseases

The United Kingdom is currently free of Classical Swine Fever, African Swine Fever, Foot-and-Mouth Disease, Swine Vesicular Disease and Aujeszky's Disease (pseudorabies). Outbreaks of these diseases seriously compromise the national herd, and substantial costs are incurred by both farmers and the state. The Veterinary Surveillance Strategy will play a key role, within which there should be improved international liaison on incidence, prevalence and spread of exotic, emerging and re-emerging diseases world-wide. The disease status within new members of the enlarged EU deserves particular attention, given the likely increase in movements and trade.

The Exotic Animal Disease Contingency Plan (Defra) outlines strategy in the event of an outbreak. This plan draws on lessons from the FMD outbreak of 2001 and provides clear guidelines, but it is only really through exercises that the practical issues and lines of communication can be adequately tested. In the event of an outbreak the plan needs to be practical and implemented rapidly under pressure. Liaison and responsibility-sharing between the many operational partners (within and across borders), together with clear definition of roles and responsibilities, is an area of concern. Independent auditing of exercises would help to quantify gaps in performance and present opportunities for improvement. It is recommended that an annual report on practical testing of the contingency plan should become part of the consultation process for future annual reviews. Consideration should be given to the provision of regular refresher courses on endemic diseases for key veterinary surgeons involved in farm animal practice alongside that provided for key Defra and State Veterinary Service staff.

Exotic diseases research might usefully address the development of risk assessment and risk management tools.

The pattern of 'new arrival' epizootics, exemplified by parvovirus, PRRS and PMWS, will be repeated in future years. Assessing the zoonotic potential of new and emerging infections should always be a high priority. The provision of funding for emerging disease research is therefore essential not only for reactive characterisation of emerging diseases and pathogens, but also for the development of new approaches to prospective surveillance for harmful new agents. Vigilance is required as to the possibility of wild and feral animals (including boar) harbouring new diseases.

It is self evident that a change in prevailing climate will change disease patterns in UK, and increase the likelihood of (a) presently exotic disease becoming endemic, and (b) new diseases arising in the pig herd.

## **Farm-level planning for pig health and the environment**

*The environmental agenda* Productivity reduction through ill health is a major cause of increased C and N footprint. Implementation of improvements in environmental protection and care requires innovative systems of production and processing management. BPEX is leading the development of the Pig Industry Environmental Strategy (PIES). Other stakeholders include government, regulators, and producers. The aim is to develop a joined-up approach for working towards better environmental performance within the legislative framework. The industry will work actively on environmental legislation (both existing and pending) of relevance to the industry. It is only through such involvement that the impact and opportunities for positive benefits to pig health and welfare can be argued.

Climate change will have consequences for animal health and welfare; these must be understood if the industry is to not be disadvantaged. Whilst outdoor pig keeping and organic production are perceived as having health and welfare benefits, there can also be dis-benefits, as well as risks of environmental compromise such as diffuse pollution.

*Conflict resolution* Energy efficiency, environmental protection and pollution control have been identified as a priority area of KT activity for the UK Pig Industry. Notwithstanding the importance of these, a collateral approach is essential to ensure that pig health and welfare is enhanced and not compromised. Initiatives in energy-saving, waste reduction, fallen-stock disposal systems, reduction of environmental emissions, ill-considered welfare legislation, and the like, may not always be to the advantage of pig health and welfare. Resolution of the conflict (where it occurs) between the imperatives of pig care and the imperatives of environmental management needs cross-cutting policy making. Reduction in environmental impact should not prejudice improvements in health and welfare.

*Health planning* Health planning can drive the production of environmentally sustainable, safe and high quality products. Its approach to production is dynamic and preventative. Resources can be focused on high-risk areas critical to the prevention of disease and the assuring safe products. The key to improving the health and welfare of British pigs is at farm level. The first step in the process of delivering action is Health Planning incorporating a Hazard Analysis and Critical Control Point culture with organisational commitment at all levels. To back up the HACCP approach training is needed for farm owners, managers, veterinary surgeons and stockpersons.

## **Authorship**

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