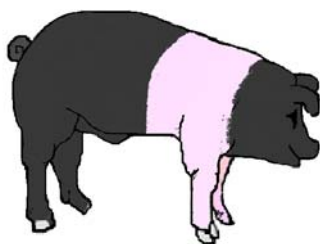


GB surveillance

Pig diseases

Quarterly Report: Vol Q4 2008

Date: 16th February 2009



The VIDA diagnoses are recorded on the VLA FarmFile database and comply with agreed diagnostic criteria against which regular validations and audits are undertaken.

The investigational expertise and comprehensive diagnostic laboratory facilities of both VLA and SAC are widely acknowledged, and unusual disease problems tend to be referred to either. However recognised conditions where there is either no diagnostic test, or a clinical diagnosis offers sufficient specificity to negate the need for laboratory investigation, are unlikely to be represented. The report may therefore be biased in favour of unusual incidents or those diseases that require laboratory investigation for confirmation.

VLA RLs have UKAS Accreditation and comply with ISO 17025 standard. SAC Veterinary Services have UKAS accreditation at their central diagnostic laboratory and at the Edinburgh and St Boswells Disease Surveillance Centres which comply with ISO 17025 standard.

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Highlights

There have been no outbreaks of Notifiable Disease or zoonoses associated with pigs.

There were no food safety incidents involving pigs in England, Wales or Scotland.

There has been a statistically significant decrease in the diagnosis of PMWS in 2008 compared with 2007, which supports field and published data on the efficacy of PCV2 vaccination. Further evidence that one of the UK's major diseases of pigs is being controlled is very encouraging to the industry.

The increased incidence of swine dysentery in East Anglia continues to be of concern but the production of a Producers Charter as an industry approach to control is welcome and hopefully will be supported by the Rural Development Agency.

There is some welcome news regarding pig meat prices and it is very encouraging to see a major retailer switching to purchasing 100% British pig meat.

PRRS continues to be of concern to the industry where its immunosuppressive effects underlie other diseases.

1) INTRODUCTION

This is the third pig surveillance report that combines information from all areas of Great Britain into a single, integrated overview of pig health across the whole region. It has been made possible through a partnership between Defra, SEERAD, the Veterinary Laboratories Agency (VLA) and Scottish Agricultural Colleges Veterinary Services (SAC VS) Division.

A key objective for any pig disease scanning surveillance system is to increase the likelihood of early detection of important changes in pig health. Any major disease occurrence, such as the FMD outbreak of 2001, can have a major impact either by threatening public health and/or animal welfare, or through its economic impact on the agricultural industry and ancillary related industries like tourism across the whole of GB. The possibility of the incursion of exotic diseases, the emergence of a new disease, or changes in known diseases are all risks which scanning surveillance seeks to mitigate. Until now, the surveillance networks north and south of the Scottish border have reported their findings separately, which reduced the likelihood of early detection of important changes in health in this single epidemiological population. The newly unified GB-wide data resource, coupled with new collaborative analytical processes should make detection of all these scenarios both easier and quicker.

The network of 14 VLA Regional Laboratories (RLs) and two Surveillance Centres (at Veterinary Schools) in England and Wales and 8 SAC VS Disease Surveillance Centres in Scotland provides a diagnostic service to private veterinary practitioners across GB. Clinical scanning surveillance information derived from diagnostic samples and carcasses is collected and analysed to determine baseline disease levels in the pig population. The aim is to provide an assessment of the current disease status of the GB pig population and to warn of potential risks from changing disease trends or new diseases and of zoonotic diseases of human health significance.

Since 1975, diagnostic data from both the VLA and SAC has been merged in the veterinary investigation diagnosis analysis (VIDA) database. This database has been an invaluable source of epidemiological trends for over 30 years, but was limited in the range of data recorded and the analyses available. In 1998, the VLA started to produce a more detailed dataset within FarmFile - a powerful database, linked to the VIDA database, containing a greater amount of descriptive epidemiological data on all submissions and incorporating analysis tools used for disease surveillance purposes. These tools provide automated statistical analysis and built-in "alerters" which highlight statistically significant, and therefore potentially clinically significant, changes in diseases diagnosis and trends enabling more extensive analysis of data for England and Wales from 1999 onwards.

The harmonisation project was initiated in 2006 to allow the extension of FarmFile analysis to cover Scotland as well. This involved the development of a single, standardised data collection system; consistent diagnostic criteria and harmonised recording, which enables the collation of the disease surveillance data from all three countries. This has been achieved by collaboration between staff and disease consultants at the VLA and SAC VS, funded by Defra and SEERAD.

Detailed surveillance data from laboratory submissions for all three countries can now be collated, providing a far greater amount of data for analysis and interpretation by disease consultants at a GB level, resulting in improved disease understanding and efficient use of relevant expertise. This should enable action to be taken and resources to be appropriately targeted at an earlier stage than was previously possible, as the dataset is now much more extensive and drawn from the whole pig population of GB. Further analyses will be developed and refined to improve disease surveillance and the health and welfare of the pig population of GB.

2) OVERVIEW - FOR 2008

Overall the expectation of steadily rising prices to levels to compensate for the high prices of feed have been largely thwarted by the current global economic situation. This has meant that the rapid fall in production across Europe has to the producer's surprise been paralleled by a fall in consumption resulting in no steady increase in the price of pig meat (pence/kg). In fact the production has not dropped as fast as consumer demand and the overall effect on prices is still unknown. For example; the Danes are losing £24 /pig and 1000 producers may depart the industry; Smithfield Industries shares have had their forecasts downgraded; fresh pork sales are down 11% in France and there are few exports to Russia.

Global production:

World pig production is expected to be up 1% in 2009 to 97.9 million tons. China's production is expected to go up by 3% (1.2 million tons). Brazil may produce 3% more (3.2 million tons total) while USA production may fall by about 2%. The EU and USA are expected to export less and fewer imports will be needed by China. Japan, the world's largest import market, is likely to remain stable whilst Mexico, in the grip of recession, is likely to require less as is Korea. Russia may require more imports.

In the final quarter of 2008 the total EU production could be down as much as 5% compared with the same period of 2007. The same would also apply to the predicted numbers in the first half of 2009. The summer census of 15 countries (90% of the EU market) showed that pig numbers had fallen to 143.3million which is down by 6% since the previous year. The most significant number was the fall of in-pig sows to 9.1 million (down 8%) particularly in Spain, Poland and Germany. Czech production has fallen considerably with imports rising rapidly. Tighter supplies saw the price rise in the second half of the year until the consumer demand began to fall.

In the EU-27 the December 2008 price was up 11% (in Euros) on the late 2007 price and in sterling terms up 35% (due to falling pound).

In the EU-27 in 2007 pig meat accounted for 46.6%, poultry 25.1%, beef/veal 18.4%, others 7% and sheep and goats 3% of meat consumption. Pig meat, in line with all meat consumption is expected to fall in 2009.

With regards to production costs, labour now accounts for 15-16% of all costs and feed 65%.

UK numbers:

It is thought that the UK herd will stabilise at around 390,000 sows.

During 2008 1% fewer pigs are likely to have been slaughtered.

Sow and boar slaughterings are however likely to have increased by 12% to over 234,000 in 2008 compared with 2007. The difference in meat prices between sow/boar and other pigs is not marked and as a consequence if there is any doubt about the productivity of a sow or boar then it is sent for slaughter.

UK productivity:

In 2008 the UK produced about (final data still being analysed) 20 slaughtered pigs per sow compared with 19.5 in 2007. This means 1.534 tonnes of pig meat per sow compare with 1.37 tonnes in the late 1990s. This is much lower than the EU average of 1.8 and the Netherlands, Denmark and France all produced over 2 tonnes.

UK consumption:

During the last weeks in December 2008 compared with 2007 there were 24% less sales in volume of pork (expenditure up 6% due to increased value) and 4% more bacon (14% increase in expenditure)

UK market prices:

Prices are higher than 1 year ago, pork prices are 26.5% higher, bacon is 16.1% higher and sausage is 13.4% higher.

Prices in 2009 are generally on the slide to end up at 130.5p/kg with a slight decline in the average weight of pigs to 76.8 kg. This is after the rises in 2008 compared with 2007.

The price of sows (mainly destined for Germany) rose to 112.3p/kg.

During 2008 the retail price rose by 2% but the producer price fell.

Overall the UK deadweight average pig price (DAPP) stood at 131.2p/kg compared with 107.2 at the end of 2007. The yearly average was 127.4p/kg which was 17% higher than in 2007.

The sow price was 113p/kg in the last week of 2008 which was 49p higher than it was the last week in 2007

The good news:

The latest report from BPEX- Pig Cost of Production Report for 2007 (£160 but free to Levy payers) showed that the post-weaning mortality continued to decline from 8.0% to 7.0%; finishing pigs sold per sow rose from 19.7 to 20.1; the average daily gain for finishing herds increased by 28g to 683g/daily; pigs weaned increased to 21.61 but this was still below the EU average of 23.26 (7% greater).

The further shift in the exchange rate between sterling and the Euro will have wiped out much of the cost disadvantage that the UK producers have been facing.

There is an increasing demand for British, regional and local food and pork is appearing much more often on the menus in restaurants etc.

At the start of 2007 the average loss was £25 /pig but by October £1 a head profit was being made and in December £4 /head profit.

The Co-operative Group is switching its entire range of own brand bacon, gammon and fresh pork to British in an initiative to support the UK farmer. Some 300 farms have signed up and the deal which will be complete by Feb 1st and will account for 54% of the company's £87 million bacon and pork category. Sausages are already British and their-own brand pre-packed UK-style ham will also be from the UK from Feb 1st.

Positive actions:

The East Anglian initiative on Swine dysentery eradication has now over 30 producers signed up to co-operate (Dec 2008) and a Producers Charter has been agreed.

Scientific advances:

George Foxcroft advises using less numbers of mixed ejaculates of semen and more single use boars as there can be as much as an 18% difference in the farrowing rates and litter size between the boars that might go into a mixed batch. He suggests using fewer sperm in a smaller dose and that boars be allowed to recover properly between collections. (Robert Knox, Nov, 2008 Pig International, p16-17.)

Ileitis vaccination was found to be cost effective in two recent trials in Germany and France (Costs of sub-clinical ileitis during finishing - an experimental approach. A.M. Scholz, S. Nuske, P. Kremer, and M. Forster (2008) Pig Journal 61, 26-35).

The initial studies of immunocastration in Switzerland have shown an improved palatability of the meat quality. There was also a leaner carcass produced with some of the performance characteristics of the intact boars. Treated boars were easier to manage with much less aggression, but there may be a drawback in that there may have to be an extra line in the abattoir to remove the testicles of the intact boars.

With the increased costs of pig feed it is important to minimise the losses of feed which may be from 5-20% of that which is supposedly consumed (BPEX Action for productivity – efficient feed usage (2008), BPEX Ltd, PO Box 44, Winterhill House, Snowdon Drive, Milton Keynes, MK6 1AX.)

There are three areas of loss: feed ingredients, feed milling, and farm management. In the case of the ingredients there is considerable variation. For example soya bean can vary from 46% protein and 7% fibre to 48% protein and 3% fibre. Meat and bone meal can have a fat content from 2-14% and an ash level of 15-30%. Phytase can unlock phytate and make more energy available and thereby save protein. This can save 3-5 euros per ton and 1-3% protein.

Enzymes can increase availability eg xylanase and betaglucuronidase and these break up cereal grain coats and release 3-5% more energy

It is essential at the milling stages to maintain the ideal and uniform particle size with not too much dust. A size of 400-500 microns is ideal for piglet starter diets. 700-800 microns is best for growing/finishing pigs and 1000 microns for sows. It is important to realise that screen damage and hammer wear can alter these sizes. If whole grains can be seen in the faeces there is something wrong. A 20% loss of grain through the gut can reduce the DE by 2.0MJ/kg. Fines and broken pellets should be less than 7%. Pigs will sort the fines out from the pellets and leave the fines adding to the wastage.

In terms of management it is essential to make sure that any equipment delivering feed is properly calibrated. Floor feeding wastes a lot through the slats resulting in covering the skin and faecal contamination.

Creep feeding needs to be with fresh food in a container. Usually it is not much use before 10-14 days of age. The flow rates need to be adjusted as creep runs at a different rate compared with weaner meals. Weaner meals are sticky so do not flow caused by adding fat or fresh milk which increases their palatability. This needs daily adjustment. Care must be taken not to add too much water to liquid feeds which then leads to feed flushing.

2.1 Demographics, submissions and carcasses

2.1.1 Diagnostic submissions and carcasses

Table 1 Pig Diagnostic Submissions and Carcasses, 2004- 2008 (Q4 only)

Table 2 Pig Diagnostic Submissions 2004 – 2008 for England, Scotland and Wales

Table 1 Pig Diagnostic Submissions and Carcasses, Q4 of 2008

Oct-Dec	Submissions			Carcasses		
	E&W	Scotland	Total	E&W	Scotland	Total
2004	351	100	451	284	54	338
2005	290	120	410	262	95	357
2006	319	114	433	282	57	339
2007	230	61	291	215	38	253
2008	301	118	419	363	90	453

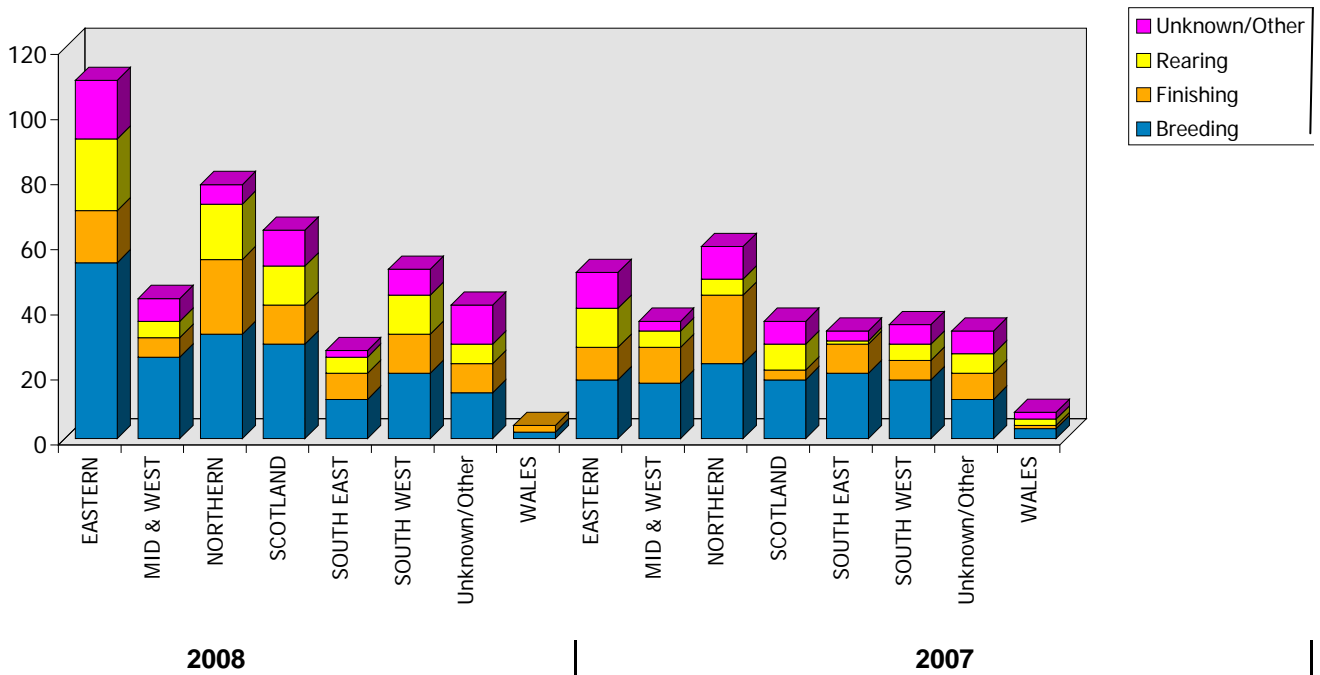
Table 2

All Years 04-08

	Breeding	Finishing	Rearing	Unknown/Other	Sum:
EASTERN	138	69	147	87	441
MID & WEST	100	71	27	21	219
NORTHERN	158	120	69	53	400
SCOTLAND	49	16	22	212	299
SOUTH EAST	69	44	20	17	150
SOUTH WEST	108	73	47	33	261
Unknown/Other	48	25	21	111	205
WALES	10	10	5	4	29
Sum:	680	428	358	538	2,004

Figure 1

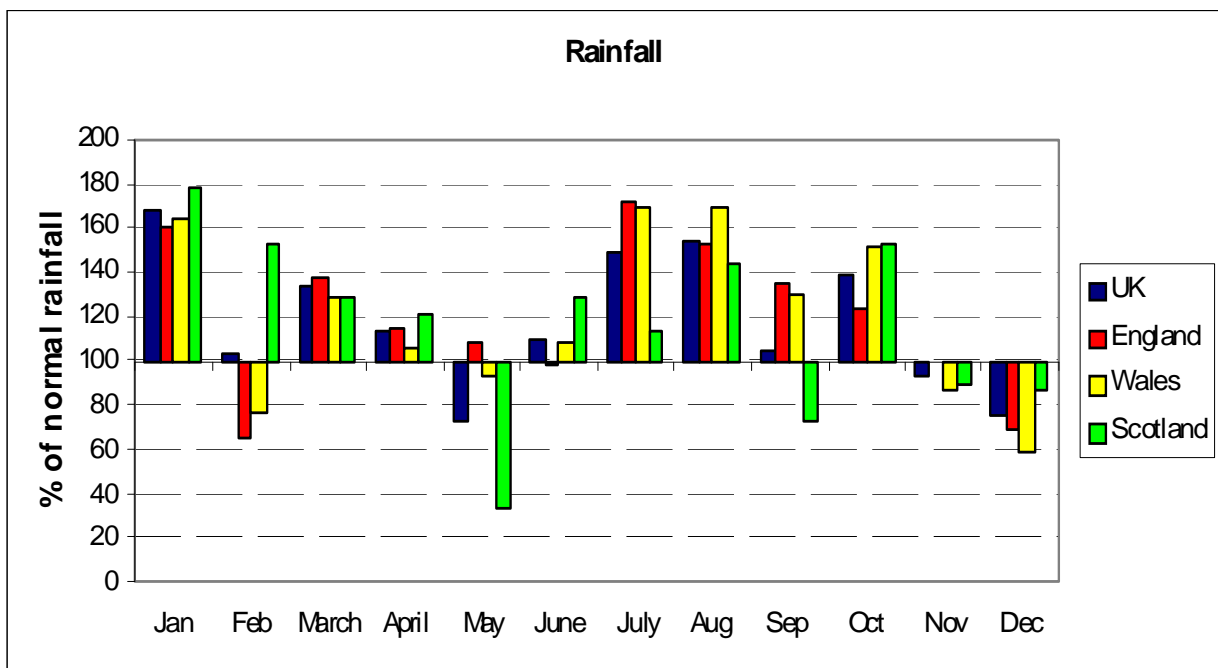
GB Diagnostic Submissions, Oct-Dec 2008 (Left) 2007 (Right)

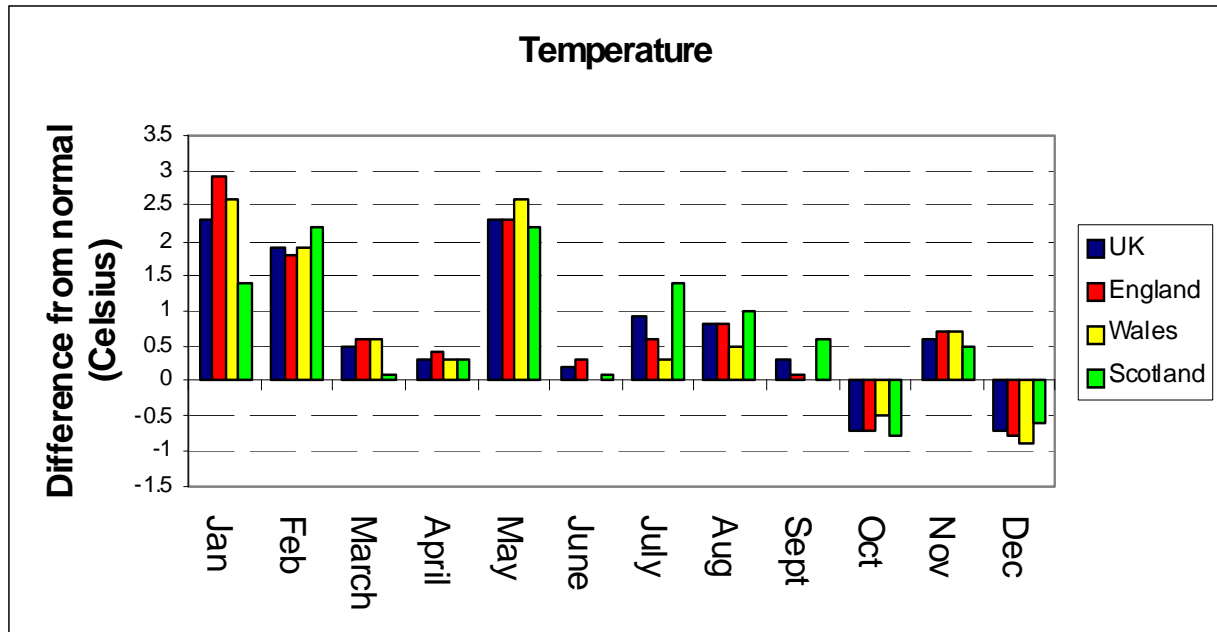


Carcase submissions for 2008 are in excess of those for the corresponding quarter in 2007. This may reflect the improvement in pig prices in 2008. Carcasse numbers include a commercial pig project (79 pigs submitted to Bury (Eastern) and Thirsk (Northern) Regional Laboratories).

2.1.2 The Meteorological Office report

Figures 2 – rainfall by month with percentage variation from normal and Figure 3 – temperature by month and variation from normal





In October, temperatures were all below average across GB. Most areas, provisionally, had their coldest October since 2003. Rainfall was well above average across N Wales and NW England, with some areas having over double their average rainfall. Provisionally for Scotland, it was the fourth wettest October since 1954. In November, temperatures were generally close of slightly (up to 1°C) above average. Rainfall in GB was close to average but some localities had significantly more and less than this. December was a very cold month across all of GB, particularly in the South and West. Maximum temperatures were generally below average and around 1°C below average across parts of southern England. Rainfall was below or well-below normal in most areas, with only around 50% of normal over parts of England and Wales, but locally 150% of normal in eastern Scotland.

2.2 Notifiable Disease Reported

Post mortem examination of a 26-week-old fat Gloucester Old Spot pig with lethargy, anorexia and terminal respiratory distress, prior to death, revealed extensive petechiation, including both kidneys which had a distinct turkey egg appearance.

Even though the sole similar aged pig on the holding remained normal and fever was not a reported feature by the owner who had regularly taken the affected pigs temperature, the post-mortem findings together with the known feeding of table scraps necessitated notification of suspect swine fever to Gloucester Animal Health Divisional Office.

On further consideration with the Duty VO, it was agreed to proceed with the post-mortem and for a VO to visit the holding in the near future. Laboratory examinations subsequently confirming a lymphoma and colisepticaemia as the cause of death

There were no other suspected Notifiable Diseases reported to Animal Health involving pigs this quarter.

2.3 Farm Investigational and Advisory Visits

Currently, farm investigatory visits by VLA Veterinary Investigatory Officers are recorded for England and Wales. For Scotland, SAC record investigations, which may or may not include a visit to a farm. Harmonisation of this information is being considered for future reports. The information below is for England and Wales only.

**Table 3:
Farm Investigation and Advisory Visits**

October to December Quarter 4	Breeder	Breeder Fattener	Breeder Rearer	Breeder Rearer Fattener	Fattener	Rearer	Rearer Fattener	Other	Total Visits
2004		2		2	2	1		1	8
2005		1	1	4	1	2	1		10
2006	2		1	7	14	3	12	3	42
2007	1		2	8	7	1	2	1	22
2008	1	2	2	9	2	2	1		19
Total	4	5	6	30	26	9	16	5	101

Fourteen of the nineteen visits in Q4 2008 were to farms where breeding of pigs occurred. These visits were as a result of positive sampling for Salmonella during the EU breeder survey.

2.4 Food Safety Incidents

Two higher profile contamination incidents occurred in the UK this quarter. The first involved the arrival of melamine contaminated soya expeller into Europe, including the UK. Further information is available on <http://www.food.gov.uk/foodindustry/farmingfood/animalfeed/melamine/>.

As a result of this incident, VLA raised awareness among veterinarians for clinical signs that may occur if animal feed is contaminated with melamine. In brief, any livestock presenting with signs of urolithiasis or renal disease should initially include melamine contamination as a differential diagnosis.

The second incident involved PCB and dioxin contamination of pig meat in Ireland due to the contamination of bread and bakery products during animal feed production. Further information is available at <http://www.food.gov.uk/enforcement/alerts/2008/dec/dioxins>

There was a single suspect Food Safety incident dealt with by Shrewsbury Regional Laboratory. A pig with a necrotising urethritis of bacterial aetiology was examined by a practitioner, who then submitted a diagnostic sample. He then retrospectively asked the VLA to screen as suspect melamine poisoning. The VLA toxicologist was consulted but there was no evidence to implicate the involvement of melamine.

3) ENDEMIC DISEASE SURVEILLANCE

A note about the disease trends charts.

This section of the report gives information on the data collected and analysed for diseases that were especially prevalent during the quarter due to seasonal influences or are especially topical or noteworthy for the period covered. For this report, data for England and Wales and Scotland have been combined onto a single histogram. Our charts show the number of diagnoses (numerator) as a proportion of the number of submissions in which that diagnosis was possible (denominator). In some charts these proportions are represented as blocks and the GB, combined, proportion as a line. The blocks are accompanied by bars indicating 95% confidence limits – generally, the greater the number of samples examined, the smaller is this range and the greater the confidence that reported figure is true. Note that the y-axis scale of the charts varies and therefore care must be taken when comparing individual charts.

3.1) Salmonella and Salmonellosis

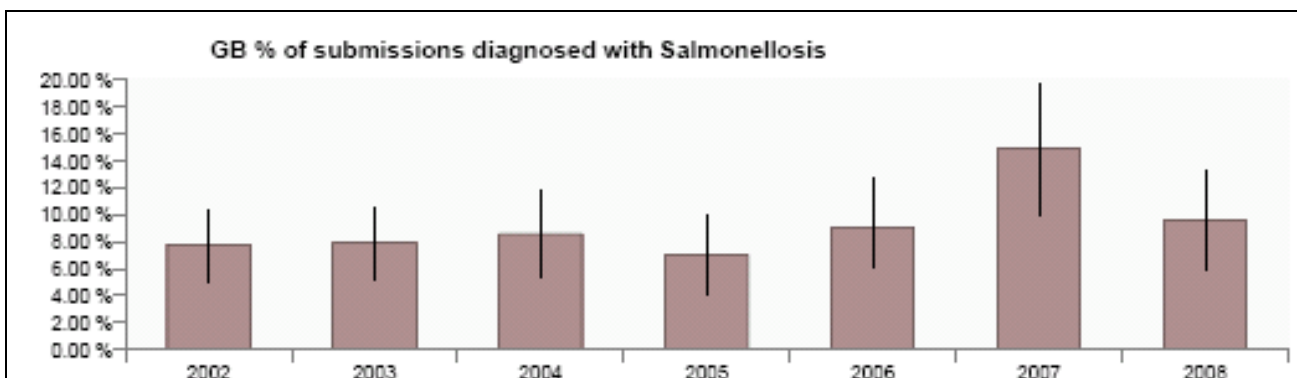
The details of the rate of diagnosis of salmonellosis from diagnosable submissions from GB are shown below, in both tabulated and graph form (Table 4 and figure 4).

Table 4: Number of diagnoses and diagnosable submissions of salmonellosis in pigs in GB during Q4 2008

Current Quarter 4 GB Rates Of Diagnosis For Salmonellosis In Pigs							
Year	Subs & Subs Tested			% Subs Rec'd Tested	% Subs Tested Diag'd	Confidence Interval	
	Num Subs Rec'd	Num Subs Tested	Num Subs Diag'd				
2002	513	385	30	75.05 %	7.79 %	5.05 %	10.34 %
2003	495	380	30	76.77 %	7.89 %	5.10 %	10.44 %
2004	447	297	25	66.44 %	8.42 %	5.26 %	11.58 %
2005	409	284	20	69.44 %	7.04 %	4.07 %	10.02 %
2006	425	288	26	67.76 %	9.03 %	6.01 %	12.74 %
2007	285	204	30	71.58 %	14.71 %	9.85 %	19.57 %
2008	384	265	25	69.01 %	9.43 %	5.91 %	12.95 %

* period currently in progress

Figure 4: Diagnoses of salmonellosis in pigs in GB in Q4 2008 as a proportion of diagnosable submissions.



As shown in table 4, 9.43% of diagnosable submissions were diagnosed with salmonellosis, compared with 9.03% in 2006 and 14.71% in 2007 in the same quarter.

Of the *Salmonella* isolates, *Salmonella Typhimurium* was, as usual, the commonest serotype isolated being 66% of salmonellae recovered.

Other *Salmonella* isolates include *Salmonella Derby*, *S. London*, *S. Bovismorbificans*, and *S. 4,5,12: 1-*, a *S. Typhimurium* variant.,

Phage typing of the 33 *Salmonella Typhimurium* GB isolates showed phage types U288 (12 isolates) and 193 (14 isolates) predominating as usual. There were more cases of PT 104 (5) in this quarter than the previous quarters, but annual figures for this isolate remain relatively constant compared with the preceding four years (NB. The total number of *Salmonella* isolates is greater than the number of diagnoses of salmonellosis because each diagnosis may have been based on more than one pig and/ or isolate).

A total of nine *Salmonella* related visits were made to pig units by VIO's during the quarter, five of which were ZO4 Zoonoses Order visits with additional sampling, following the isolation of *Salmonella spp.* from samples collected by Animal Health, as part of the EU Breeder Pig Survey. A variety of *Salmonella* serotypes were identified, including *S. Orion*, *S. Heidelberg*, *S. Typhimurium* and *S. Kedougou*. Possible rodent involvement in the level of environmental contamination seen on some units was noted. Control of rodents is probably the most critical intervention in the reduction of salmonella prevalence on poultry units (Davies & Wray 1995), especially multi-age laying sites, and there is evidence to suggest that *Salmonella enteritidis* strains which have passed through mice, are more virulent and invasive to poultry (Guard-Petter et al. 1997). It is not certain that *S. Typhimurium* strains exhibit the same level of enhanced virulence by interacting with mice, or that rodents are as critical in salmonella control in pig farms, but it seems likely that there are situations where they are important in recycling infection between different areas of the farm and hence different ages of pigs.

Three of the visits were prompted by the presence of clinical salmonellosis, manifesting as severe scour and necrotic enteritis. One of the units reported a post weaning mortality problem, rectal prolapses and strictures, a recognised sequel to salmonellosis.

An outbreak of scour in six-week-old weaners on a contract rearing unit was investigated. Four dead animals were examined and the consistent finding was a necrotic enterocolitis. *Salmonella Typhimurium* phage type U288 was isolated from these pigs. A *Salmonella* sampling visit to this farm was carried out.

Salmonellosis due to *Salmonella Typhimurium* phage type 193 infection was diagnosed from colon submitted from six-week-old pigs with diarrhoea, wasting and some deaths. A necrotic colitis was seen in on-farm necropsy. Forty of 150 pigs were affected with 20 deaths on this indoor nursery unit.

Wasting, malaise and inappetence were reported in a group of 1,200 Hampshire pigs being reared outdoors from which 20 had died. Sows were vaccinated for PCV2. A chronic necrotic typhlocolitis was identified in two pigs submitted, one of which had a mild polyarthritis and the second had a chronic mild pneumonia. *Salmonella Typhimurium* phage type 208 was isolated from internal viscera as well as the intestines pointing to *Salmonella septicaemia*. PRRS virus was detected in both spleens by PCR. As PRRS virus is immunosuppressive, its presence in these growing pigs was considered significant.

The carcasses of two six-week-old Landrace cross Duroc pigs were submitted for post-mortem examination. The pigs were from a group of 85 in which 20 had died. The group had a history of scour whilst in the farrowing crates. At necropsy there was a necrotising typhlocolitis and mild bronchopneumonia. Multi-drug resistant *Salmonella* Typhimurium phage type U288 was cultured from the large intestine. Histological examination revealed a necrotising fibrinous colitis and necrotising hepatitis and cholecystitis, consistent with salmonellosis. In addition there was a necrotising tonsillitis and necrotising and fibrinous bronchopneumonia. Culture of the lung resulted in the growth of *Streptococcus suis* type 2 and also the identification of *Mycoplasma hyorhinis* by DGGE. There was no histological evidence of PMWS in these pigs. An advisory visit was carried out.

References

Davies, R. & Wray, C. (1995) Mice as carriers of *Salmonella* enteritidis on persistently infected poultry units. *Veterinary Record*, **137**, 337-341.

Guard-Petter, J., Henzler, D.J., Rahman. M.M. & Carlson, R. (1997) On-Farm Monitoring of Mouse-Invasive *Salmonella enterica* Serovar Enteritidis and a model for its association with the production of contaminated eggs. *Applied and Environmental Microbiology* **63**, (4), 1588-1593.

Annual Trends for salmonellosis

Figure 5 below shows that there was an increase in the diagnostic rate of salmonellosis in mid to late 2007, followed by a sharp drop in early 2008. These trends are not reflected in overall annual rates, as shown in figure 6 below. The sharp rise may reflect ongoing poor health as a result of chronic PCV2 infection, or an increased focus on salmonellosis as a differential diagnosis, as a result of the ZAP project.

Otherwise, seasonality for salmonellosis does not follow a reproducible pattern.

Figure 5: Seasonal trends in the diagnosis rates of salmonellosis (as a proportion of diagnosable submissions) in GB since 2002.

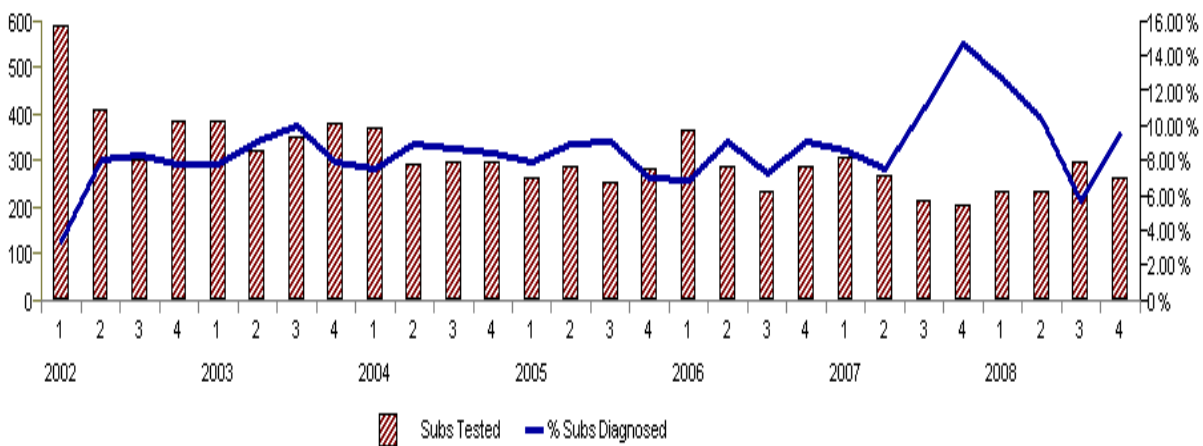
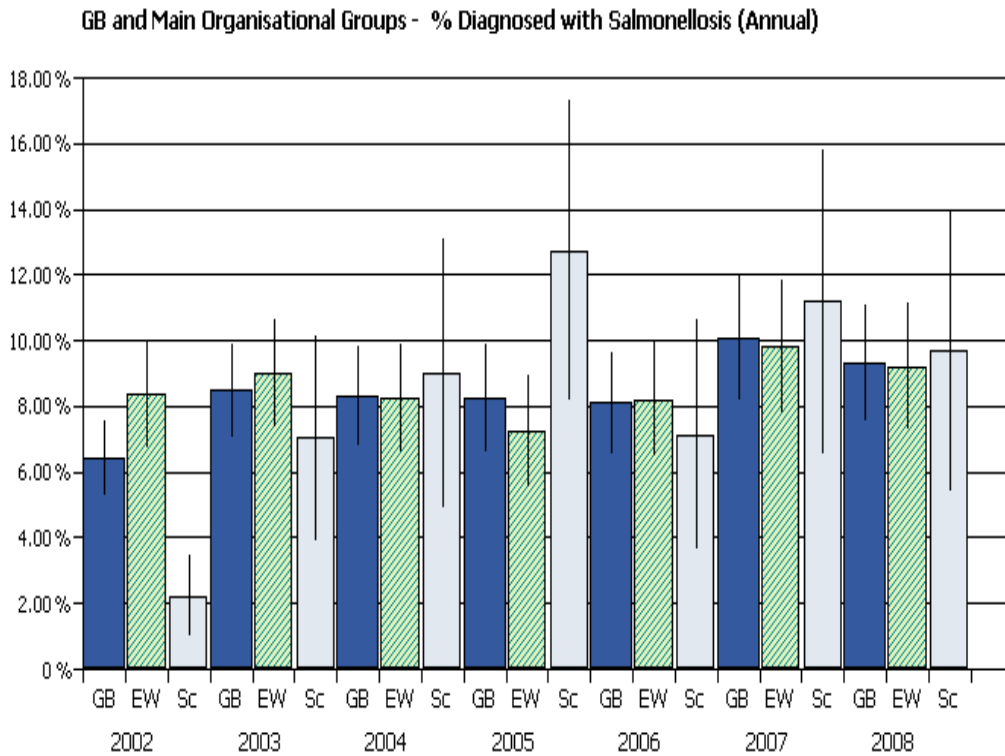


Figure 6 below, shows the annual rates of salmonellosis in GB pigs. No statistically significant trends emerge in annual diagnosis rates since 2002.

Figure 6: Annual rates of diagnosis of salmonellosis in pigs (as a proportion of diagnosable submissions) in GB.



The Zoonoses National Control Plan (ZNCP) for Salmonella in pigs commenced in April 2008, following on from the Zoonoses Action Plan (ZAP). Requests to VLA for support visits and sampling related to ZNCP have been minimal, with only one requested support visit carried out so far. However, there has been more enthusiastic interest in the intervention study which forms part of ZNCP, with 26 farms enrolled so far.

3.2) Brucellosis

Table 5: Samples tested in 2008 for *Brucella suis*, method and reason for testing

	RBT		SAT		CFT		cELISA		Samples for Primary isolation
	Import	Export	Import	Export	Import	Export	Import	Export	
Oct-Dec 07	31	98	41	319	31	0	1	777	70
Jan-Mar 08	84	16	84	149	84	0	84	12	81
April-June 08	0	52	0	16	0	2	0	17	13
July- Sept 08	0	0	0	127	0	0	0	0	26
Oct -Dec 08	31	0	70	0	0	0	0	11	7

Brucella suis was not isolated from the 7 primary cultures from diagnostic submissions undertaken in the fourth quarter of 2008. No true positive sample results were obtained.

3.3) Streptococcal Infections

Table 6: *Streptococcus suis* figures for October to December 2005 –2008

Year	1	2	3	4	5	7	8	9	10	12	14	15	16	22	23	25	31	33	1/2	UT	Totals	
2005		15	4	4											1		1					25
2006	3	11	1	1			1			1		1							1	1		21
2007	1	8	5			2	1	2				1								1		21
2008	1	12	2	1		2	1						1	1					1	3		25

UT = untypable

Table 6 shows that *Streptococcus suis* type 2 remains the predominant isolate this quarter with overall spread of isolates similar to previous quarters. SAC reported an increased incidence of untypable *Streptococcus suis* and will be collaborating with Bury St Edmunds Regional Laboratory to look at these isolates further.

It was noted in the previous quarter that there appeared to be an increase in *S.suis* isolates resistant to three or more antibiotics when looking at years 2004, 2006 and 2008. When the figures were examined statistically it was found that there was no statistical significance but more data will be examined.

No other bacteria isolated from pigs and of note were referred to Bury St Edmunds (determinative bacteriology Regional Laboratory for England and Wales).

3.4 PORCINE CIRCOVIRUS ASSOCIATED DISEASE (PCVD)

3.4.1 Post weaning multisystemic wasting syndrome - PMWS

The decline in quarterly percentage of relevant diagnostic submission with a diagnosis of PMWS continued for Q4 (see histogram figure 7) and annually (see histogram figure 8). The GB diagnostic rate for PMWS in 2008 was the lowest (5.3%) since the peak in 2003 of 24.6% and figures for 2008 show a statistically significant decrease from 2007 and all previous years apart from 2006. These data reflect positive practitioner feedback on the value of PCV2 vaccines in reducing disease.

Figure 7: Percentage of submissions diagnosed with PMWS in Q4 compared with previous years same quarter

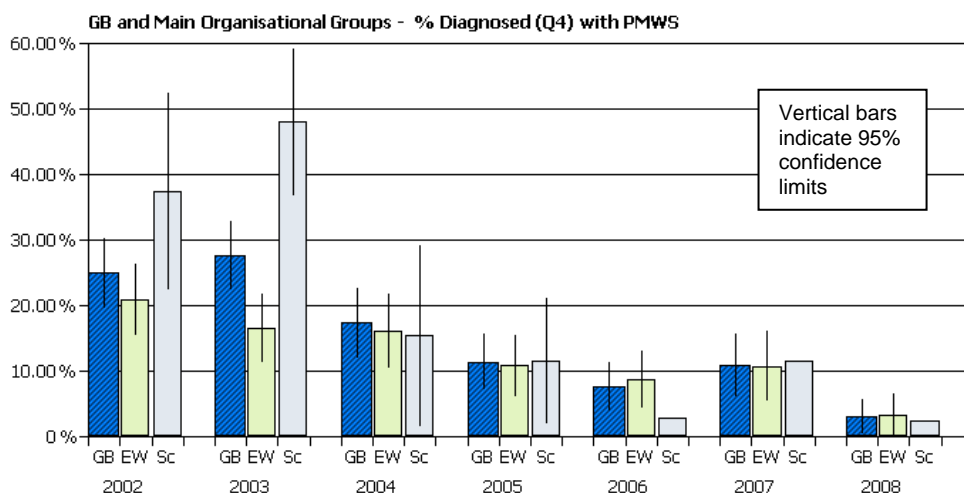
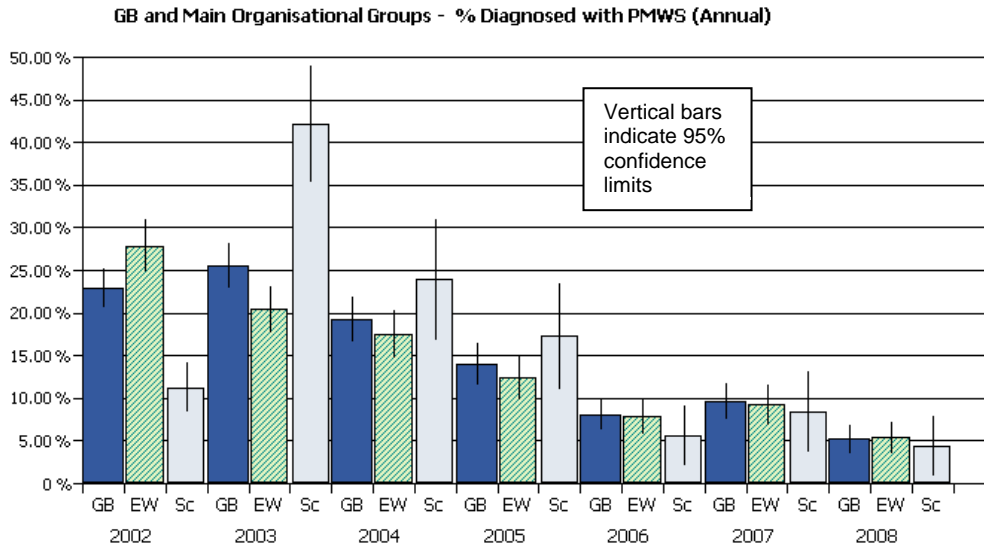


Figure 8: Percentage of submissions diagnosed with PMWS in 2008 compared with previous years



- One of the less common manifestations of PCV2 disease, circoviral hepatitis, was diagnosed in a wasted, outdoor reared, pre-weaned, rare-breed cross, six week-old pig. This disease presentation has previously been seen, by the VLA, in rare breed pigs. Interestingly this unit had been closed for fourteen years prior to the arrival of a Large White boar shortly before this case occurred.
- PMWS was diagnosed for the first time on a 50-sow breeder finisher unit resulting in 3% mortality and ill thrift in eight to twelve week old pigs.
- A continuation of a questionnaire based study looked at cases of porcine circovirus associated disease (PCVAD) between 1st May and 31st December and the history of vaccine use. Of thirty cases of PCVAD identified during this period further information was available for 17. Of these seventeen there were four cases in herds using PCV2 vaccine in sows but not piglets; of these three had PDNS combined with PMWS or PCV2 associated pneumonia and one case had five concurrent diagnoses including PRRS. A single case of PCV2 associated pneumonia occurred in 13-14 week old pigs which were PCV2 vaccinated at three weeks old. The pigs also had concurrent pneumonia due to PRRS and overall herd health was described as improved since the implementation of PCV2 vaccination.

3.4.2 Porcine dermatitis nephropathy syndrome (PDNS)

The decline in quarterly percentage of relevant diagnostic submission with a diagnosis of PDNS continued for Q4 (see histogram figure 9) and annually (see histogram figure 10).

The annual GB diagnostic rate for PDNS in 2008 was the lowest (2.0%) since the peak in 2005 of 6.4%.

Figure 9: Percentage of submissions in Q4 diagnosed with PDNS compared with the same quarter in previous years

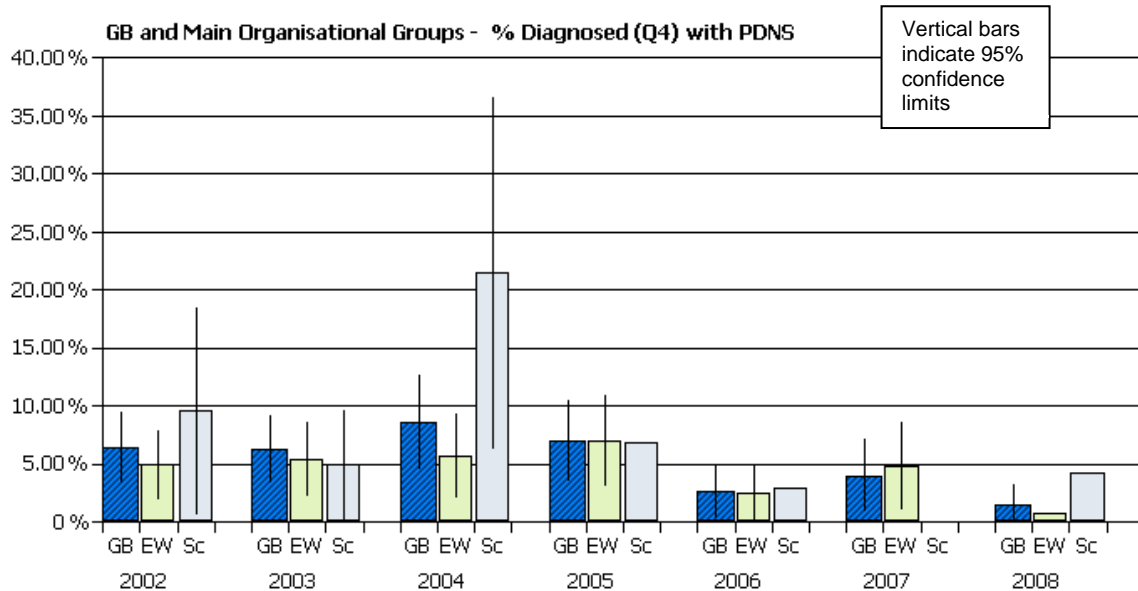
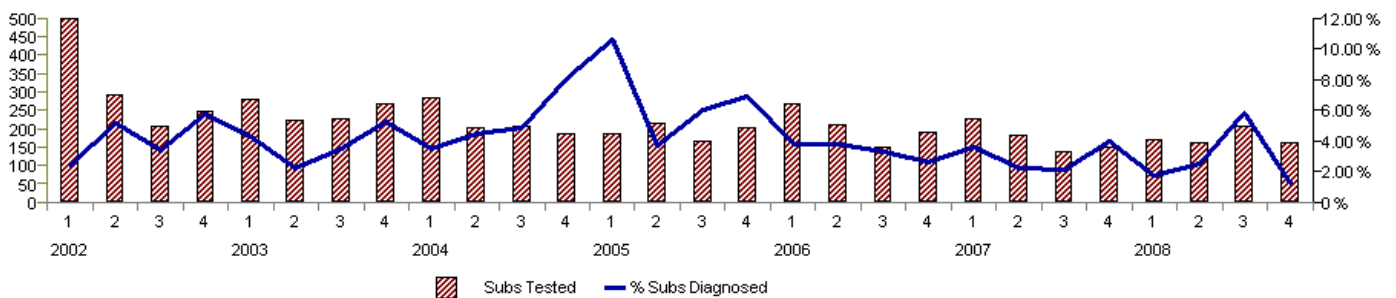


Figure 10: Percentage of submissions diagnosed with PDNS in 2008 compared with previous years



3.5 PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRS)

The quarterly percentage of relevant diagnostic submission with a diagnosis of PRRS showed a marginal increase, which was not statistically significant, on the same quarter last year (see histogram, Figure 11). This data includes diagnoses of pneumonia associated with PRRS, systemic PRRS and foetopathy associated with PRRS. The annual percentages of submissions diagnosed with PRRS for GB peaked in 2008 (see histogram, Figure 12). This peak in 2008, which is not statistically significant, is largely due to increased disease in England and Wales (again not statistically significant) with a peak of 19 cases in Q1 of 2008 (see histogram, Figure 13).

Figure 11: Percentage of submissions diagnosed with PRRS in Q4 compared with the same quarter in previous years

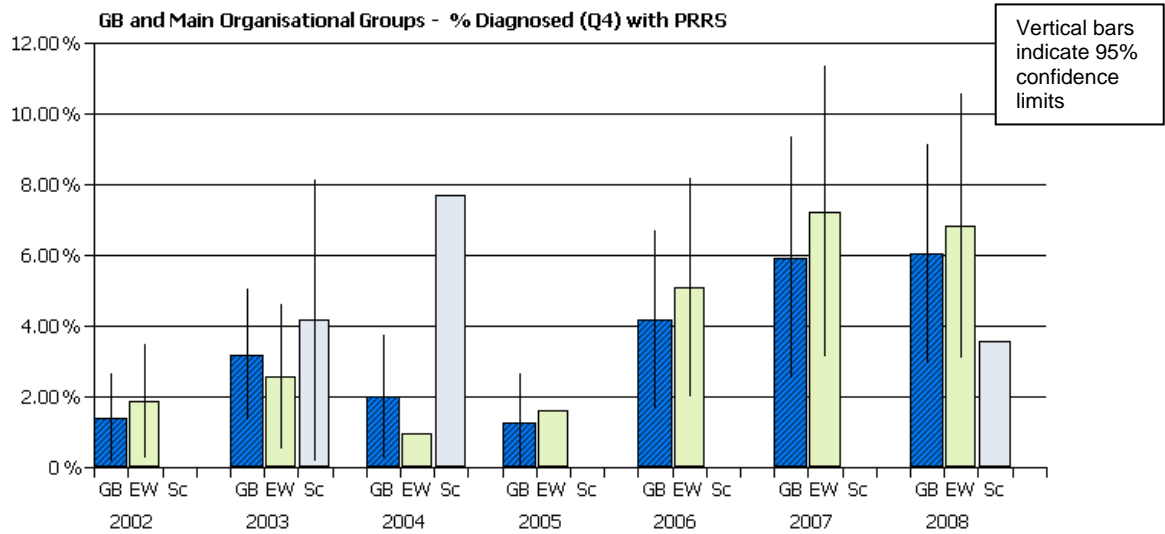


Figure 12: Percentage of submissions diagnosed with PRRS in 2008 compared with previous years

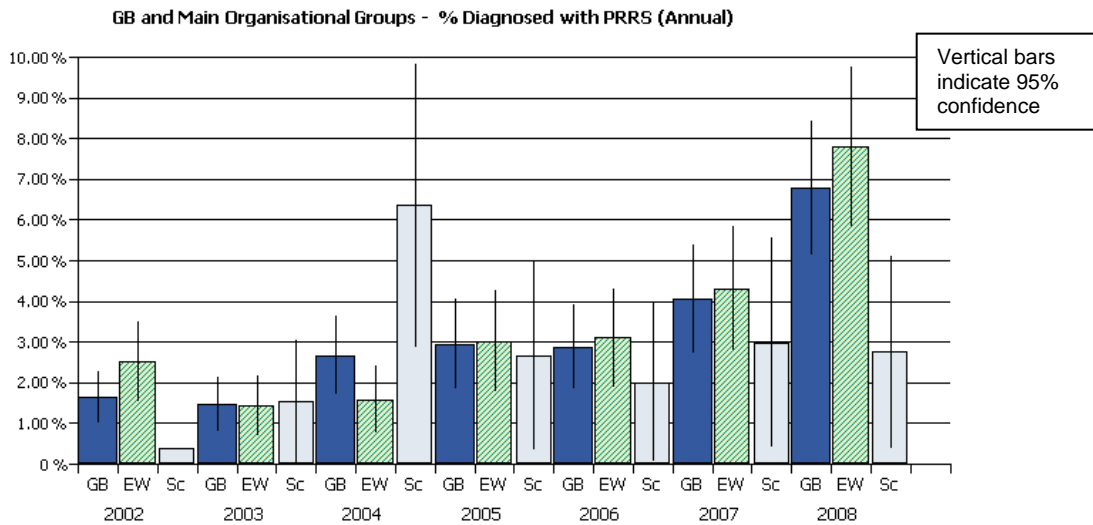
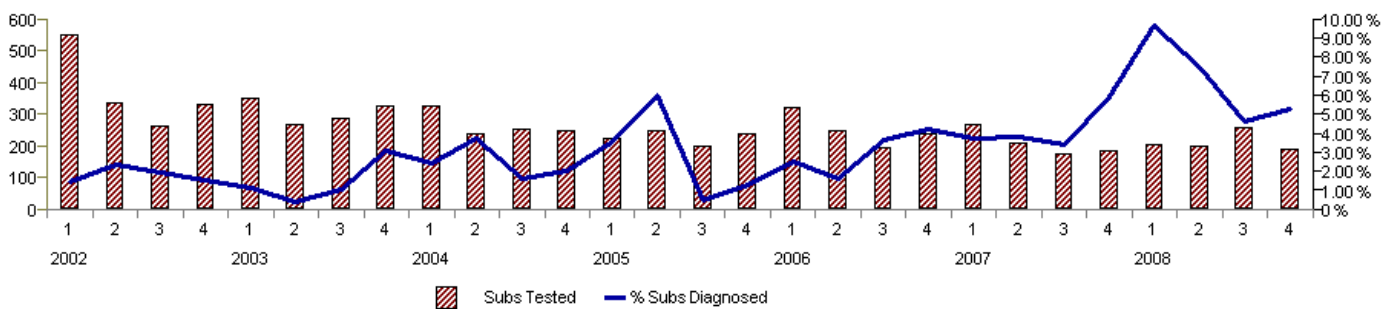


Figure 13: Trends in diagnosis rates of PRRS as a proportion of diagnosable submissions since 2002



3.6 RESPIRATORY DISEASE

The quarterly percentage of relevant diagnostic submissions with a diagnosis of pneumonia and/or pleurisy (excluding PRRSV and PCV2 associated disease) was stable for this quarter compared with the same quarter in previous years (see histogram, Figure 14) and for 2008 compared with previous years (see histogram, Figure 15). There was a non-statistically significant decline in the incidence of pneumonia in Scotland.

Figure 14: Percentage of submissions diagnosed with pneumonia and/or pleurisy in Q4 compared with the same quarter in previous years

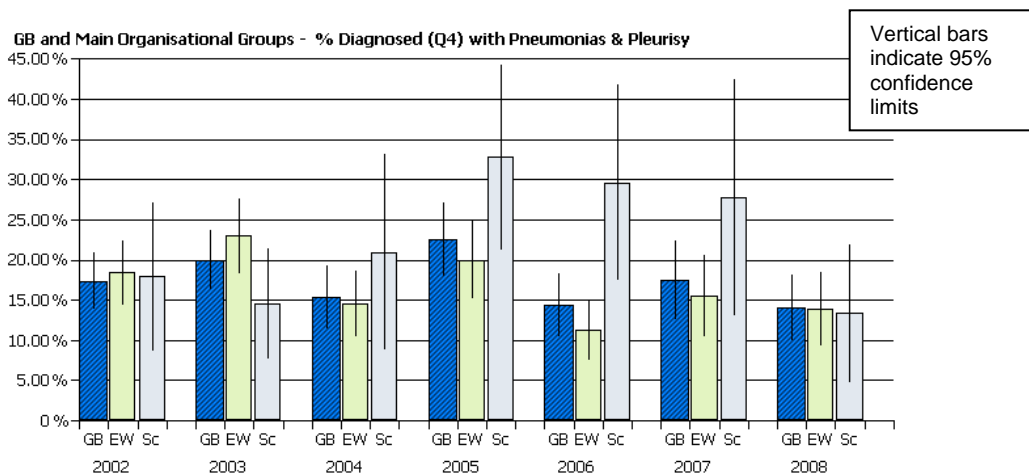
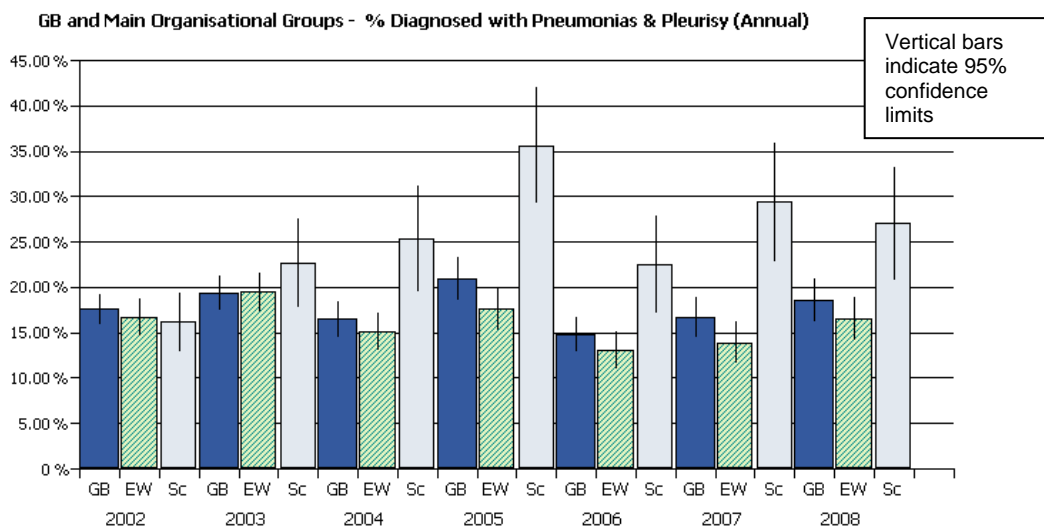


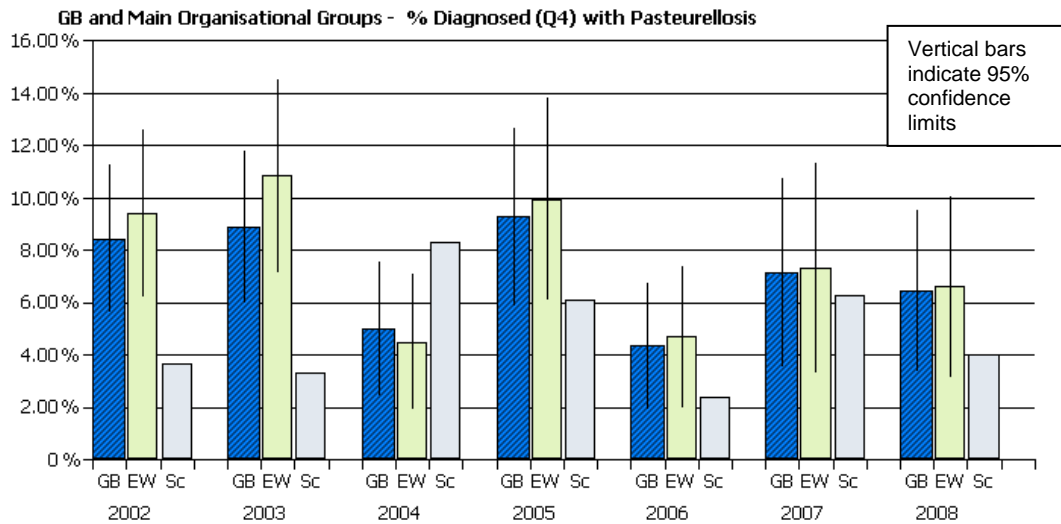
Figure 15: Percentage of submissions diagnosed with pneumonia and /or pleurisy in 2008 compared with previous years



3.6.1 Pasteurellosis

There was no statistically significant change in diagnoses of pasteurellosis compared with the same quarter last year (see histogram, Figure 16).

Figure 16: Percentage of submissions diagnosed with pasteurellosis in Q4 compared with the same quarter in previous years



3.6.2 Actinobacillosis

Figure 17 shows a decrease, not statistically significant, in diagnoses of *Actinobacillus pleuropneumonia* pneumonia for GB compared with Q4 since 2002. Diagnoses of *Actinobacillus pleuropneumonia* pneumonia for GB for 2008 showed an increase from the previous two years (see Figure 18)

Figure 17: Percentage of submissions diagnosed with pleuropneumonia due to *Actinobacillus pleuropneumoniae* in Q4 compared with the same quarter in previous years

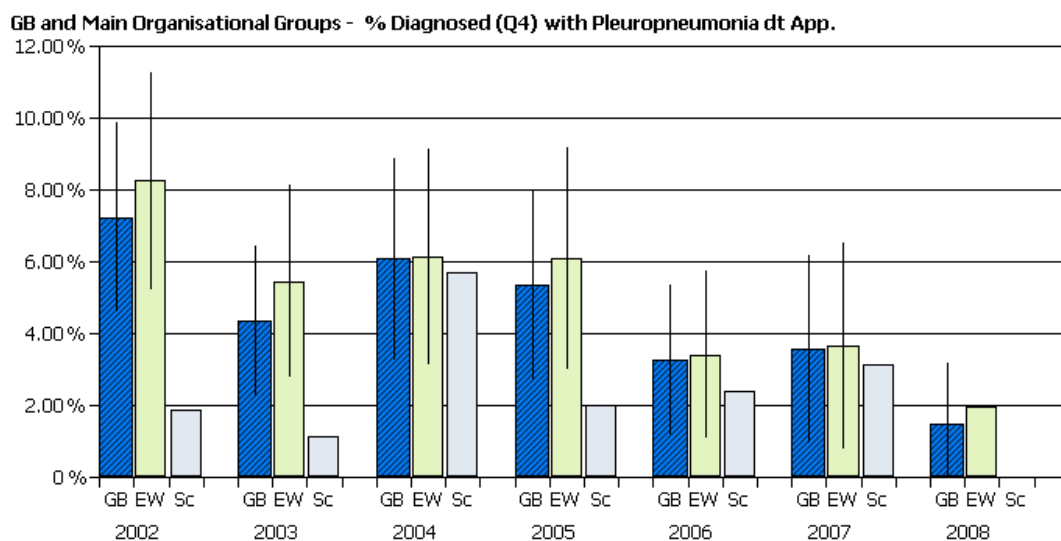
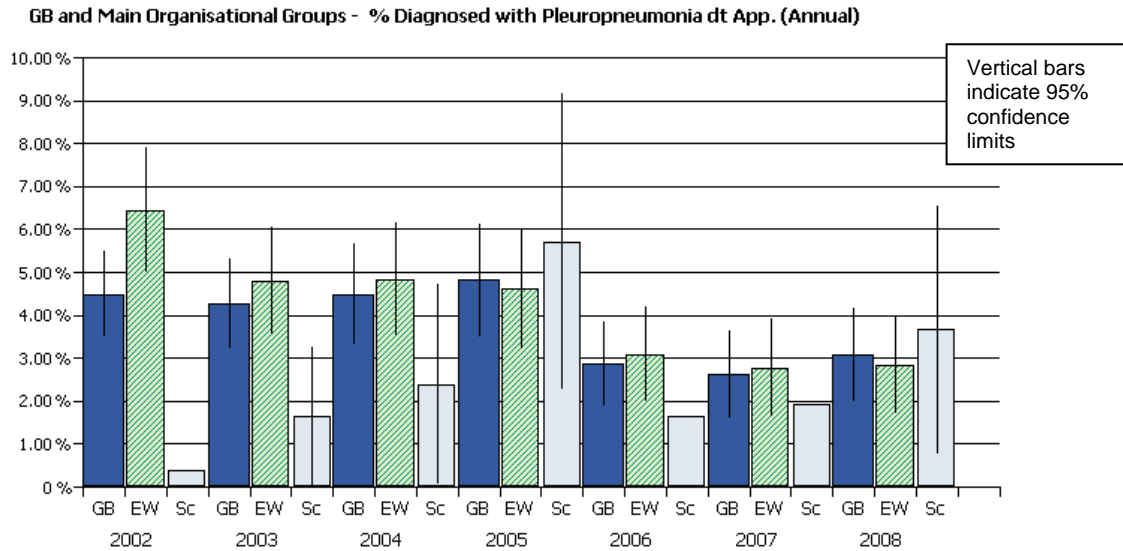


Figure 18: Percentage of submissions diagnosed with pleuropneumonia due to *Actinobacillus pleuropneumoniae* in 2008 compared with the same quarter in previous years.



3.6.3 Enzootic pneumonia

The numbers of cases diagnosed with enzootic pneumonia in England and Wales peaked in Q2 and Q3 of 2008 but has shown a non-statistically significant decrease this quarter although still the highest Q4 number of diagnoses since 2002 (see histogram, Figure 19). These peaks in cases earlier in 2008 are reflected in the annual data for England and Wales where there is a statistically significant increase in the number of diagnoses of enzootic pneumonia compared to 2007. Conversely the number of diagnoses of enzootic pneumonia in Scotland decreased resulting in the overall GB % of submissions diagnosed with enzootic pneumonia being stable (see histogram, Figure 20). A possible explanation for the increased diagnostic rate in England and Wales is a change in diagnostic procedures with only DGGE (PCR) being performed rather than mycoplasma culture. In addition pig producers may be choosing between Mycoplasma and PCV2 vaccination due to economic pressure. Possible causes of the decreased diagnostic rate in Scotland are the restocking of depopulated farms with minimal disease pigs as part of the Scottish pig health initiative and increased uptake of vaccination in infected herds.

Figure 19: Percentage of submissions diagnosed with enzootic pneumonia in Q4 compared with the same quarter in previous years

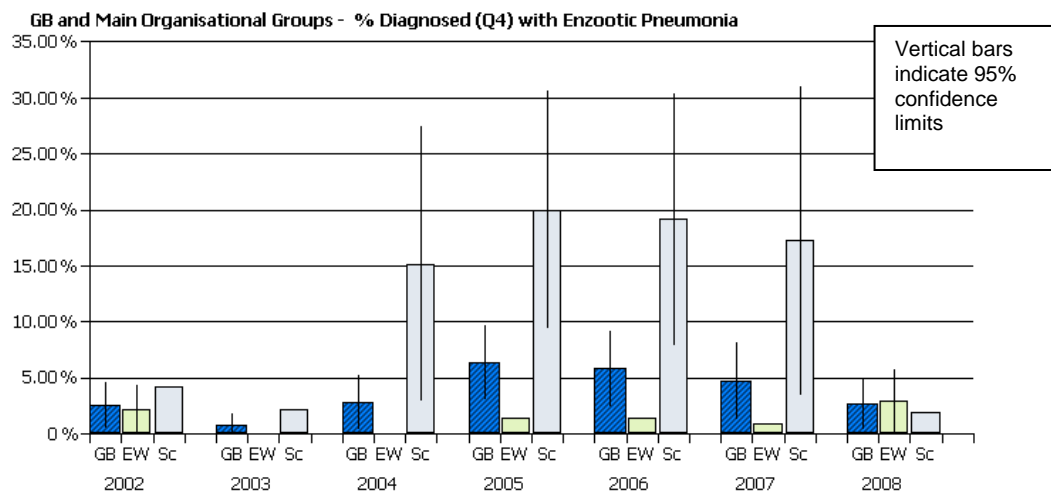
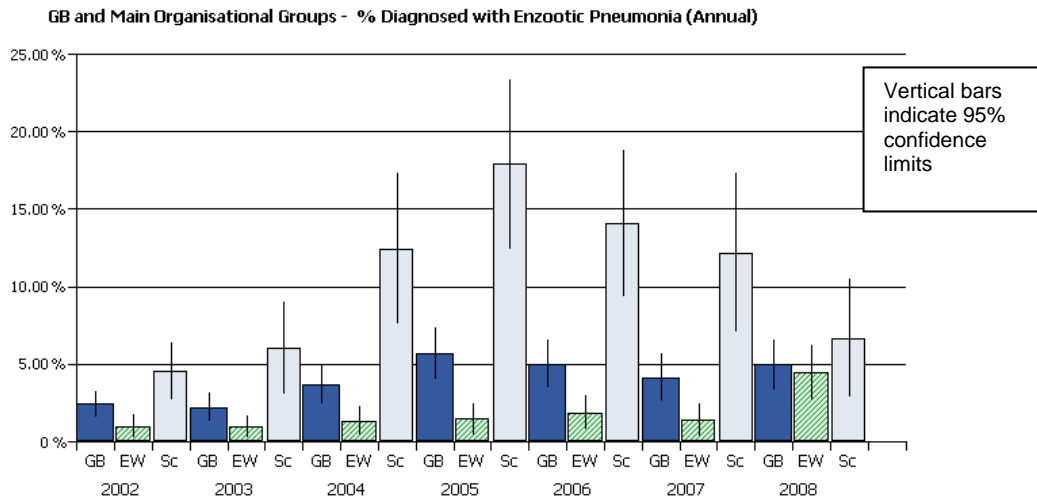


Figure 20: Percentage of submissions diagnosed with enzootic pneumonia in 2008 compared with previous years



There is growing evidence from the field and from experimental infections that some strains of *Mycoplasma hyorhinis* can cause enzootic pneumonia in their own right as well as occasionally causing polyarthritis, polyserositis, eustachitis and otitis in piglets. During this quarter a new VIDA code was introduced to record diagnoses of pneumonia due to *Mycoplasma hyorhinis*. During the quarter a single case was recorded against this new code.

3.6.4) Swine Influenza

Table 7: Number of samples tested for swine influenza and the number positive by quarter and year

Year	Q1 no tested	Q1 no (%) positive	Q2 no tested	Q2 no (%) positive	Q3 no tested	Q3 no (%) positive	Q4 no tested	Q4 no positive	Total
2007	46	4 (8.7%)	23	1 (4.3%)	11	0 (0%)	22	3 (13.6%)	102/8 (7.8%)
2008	84	3 (3.6%)	64	4 (6.3%)	72	2 (2.8%)	176	4 (2.3%)	396/13 (3.3%)

All isolates recovered in the first three quarters of 2008 were the avian-like swine H1N1 (prototype virus described as H195852). In the fourth quarter there was one avian-like swine H1N1 and three H1N2 isolates.

An outbreak of swine influenza occurred in East Anglia in November 2008 in a 550 sow herd (weaning into outdoor cosikennels) in a pig dense area, with other sows within half a mile and ducks and geese in a proximal field. Initial signs seen at the end of October were lethargy, inappetance and pyrexia. Coughing was noted and there was rapid spread within the herd. 60% of the weaners became affected. At least 80 sows were treated. Four sows died in the ten weeks prior to the signs with ten deaths in the next four weeks. An increase in stillbirths, poorer pigs weaned and increased pre-weaning mortality was reported, but this was not attributed to swine influenza (SI). 20 post-mortems were undertaken. No virus was isolated from November submissions and there was inconclusive serology but the virus was demonstrated by IHC in tissues from a sow and suckling piglet.

In December intensive sampling was undertaken from four sows and 14 pre and post weaned pigs.

SI was confirmed in the same village in December in another herd. Disease due to swine influenza has been confirmed in a total of 3 farms and two more suspected outbreaks are being investigated. Concerns were raised about the diagnostics because of the delay in initially detecting infection. Sera from the sows and convalescent sera from growing pigs demonstrated an antibody rise but it was not sufficient (inconclusive). When tested against the H1N2 virus that was subsequently isolated, a better response was obtained. Compared with the other stored H1N2 viruses from previous years the isolate showed 9% divergence which is significant.

The closest relation was an isolate from 1996. The current isolate groups with other UK isolates and is not another strain from the EU. It looks like a variant and in the light of this experience the Virology department will be testing sera submitted previously using these field strains to establish if this virus is representative of contemporary field isolates. In addition checks will be undertaken on the second virus to see if it is the same as the first.

There are plans to screen diagnostic samples by looking for the M gene using a PCR. If samples were PCR positive then virus isolation would be performed, in a similar way to how wild birds are screened for influenza. There is a need to be sure that the test for the M gene is robust and has been validated before this can be done. The virus may only be detectable in plasma for 24 hours but in tissues it may be detected beyond seven days, although this would depend on the strain and the tissue. Clinical signs can be seen 24 hours post infection with virus detected in swabs from the trachea. There is no evidence that H1N2 infects birds, who then shed the virus, but they can act as mechanical vectors. The bivalent vaccine H1N1 and H3N2 does not protect against H1N2 infection.

3.7) Alimentary Disease - See section 5.

3.8) Mycoplasmas

3.8.1) *Mycoplasma* Surveillance

VLA Luddington investigated a respiratory disease problem in weaned pigs. Of four pigs submitted for post mortem examination, two had a purulent pneumonia, one had evidence of Glasser's Disease and the fourth had lesions characteristic of enzootic pneumonia. *Mycoplasma hyorhinis* was isolated from three carcasses and *Mycoplasma hyopneumoniae* was isolated from the fourth pig's lung.

VLA Bury St Edmunds carried out a post mortem examination on a breeding boar euthanised due to chronic lameness. Bilateral femoral head epiphysiolysis was diagnosed and milder changes typical of osteochondritis dissecans were seen in both shoulder joints. In addition an excess of synovial fluid was present in hock and elbow joints and *Mycoplasma hyosynoviae* was detected in synovial fluid; this organism is associated with arthritis in pigs.

In the 4th quarter, 54 porcine samples from 35 cases were submitted to the Mycoplasma group. *M. hyopneumoniae* was identified on 6 occasions twice mixed with *M. hyorhinis*, all were from lung samples. Additionally, *M. hyorhinis* was detected 11 times from lungs and once mixed with *M. arginini*. *M. hyosynoviae* was identified four times, all from joints and related sites.

During the whole of 2008, 103 porcine samples were identified as containing the following mycoplasma species: *M. hyorhinis* (46.4%); *M. hyopneumoniae* (27.2%); *M. hyosynoviae* (20.2%); *M. arginini* (4.4%) and *M. flocculare* (1.8%).

3.8.2) *Mycoplasma* News from Publications

Krakowka *et al.* 2008 report that many commercial *Mycoplasma hyopneumoniae* bacterins are contaminated with porcine torque teno virus (TTV) DNA's, which could potentially infect naïve swine.

Experimental infections of SPF pigs with *Actinobacillus pleuropneumoniae* type 9 either alone or in combination with *Mycoplasma hyopneumoniae* at 6 or 10 weeks of age showed that *M. hyopneumoniae* causes typical mycoplasmal signs, pneumonia and seroconversion at both ages. However, *A. pleuropneumoniae* type 9 caused lung lesions at 6 weeks but not at 10 weeks. Although there was good sero-conversion after infection at 10 weeks lesions were almost non-existent (Marois *et al.*, 2008). They conclude that *M. hyopneumoniae* may potentiate *A. pleuropneumoniae* infection.

Krakowka *et al.*, 2008. Evaluation of *Mycoplasma hyopneumoniae* bacterins for porcine torque teno virus DNAs. *Am. J. Vet. Res.* **69**: 1601-1607.

Marois *et al.*, 2008. Experimental infection of SPF pigs with *Actinobacillus pleuropneumoniae* serotype 9 alone or in association with *Mycoplasma hyopneumoniae*. *Vet Microbiol.* <http://dx.doi.org/10.1016/j.vetmic.2008.09.061>

3.9) Reproductive Diseases

There were 16 submissions for the diagnosis of abortion: 13 in October, three in November and none in December, demonstrating an expected seasonal decline, after the usual peak (Autumn abortion syndrome), in this problem. Eighteen submissions for other reproductive diseases also demonstrated a progressive decline over the quarter with 11 of these received in October, five in November and only two in December. High serological titres to *Leptospira Bratislava* were associated with foetal absorption (confirmed by scanning) on one farm and increased return rates on another. From abortion samples, a definitive diagnosis was made once, when PRRS virus RNA was detected by PCR in foetuses from a gilt. Gross pathological changes in the foetuses included oedema of the head, with subcutaneous and renal haemorrhages.

3.10) Nervous Diseases

See section 4 for an update on the polioencephalomyelitis cases.

4.0) UNUSUAL AND NEW DISEASES

A single case of suspect viral myelitis was diagnosed in this quarter. This was a fattening unit where there had been 20 sporadic cases in 22-week-old pigs out of 2000. The case presented was the last pig to be affected with "CNS signs including ataxia" and because the unit was being depopulated there were no further cases to examine. The farmer agreed to submit further cases if similar clinical signs are seen in the next batch. Unfortunately the pig submitted had been shot so it was not possible to determine if the pathology noted in the spinal cord was present in the brain as well. See section 6 of this report for an analysis of DNR nervous diseases.

An update on the encephalomyelitis in Gloucestershire pigs – 1 Further investigation was carried out by RT-PCR and primers designed on the microarray probes. All the spinal cord samples gave a DNA band of expected size. Sequence data (60bp) revealed similarity to PEV-8. Further sequence data was obtained by designing overlapping primers on the published sequence of 3D polymerase of PEV-8.

2 Sequencing of this product confirmed the virus to be a porcine enterovirus –8. Phylogenetic analysis of the 1400bp sequence of the 3D polymerase gene confirmed the hypothesis that the virus detected in the spinal cord from these animals is closely related to PEV –8. **Ongoing work – 1** Some of the sequencing is being repeated and the molecular analysis has to be completed to include other viruses. **2** Samples are being prepared for electron microscopy. **3** IHC is being considered but no suitable sera has yet been identified. **4** Isolation of the virus in culture is being pursued.

Overall the investigators demonstrated that the animals were infected with PEV-8 which is consistent with the histopathological diagnosis of a porcine teschovirus/enterovirus polioencephalomyelitis. Traditionally PEV-8 has been associated with reproductive disorders (SMEDI syndrome) and possibly diarrhoea. Extensive research and discussion with colleagues failed to find any previous cases where PEV-8 had caused a polioencephalomyelitis. However, many of the early papers fail to differentiate this virus from other porcine Picornaviridae, in particular entero and teschoviruses.

5) SYNDROMIC DISEASE ANALYSIS

VLA and SAC VS record both the main clinical signs and the main body system for each diagnostic submission that is examined. This allows analysis of data for the major clinical presentations (e.g. diarrhoea, respiratory signs, found dead, wasting/poor condition) and for the main body systems (e.g. circulatory, respiratory, urinary). This data can be further examined for other major risk factors, such as type of pig, housing, organic status and age, which are recorded on the form accompanying the submission.

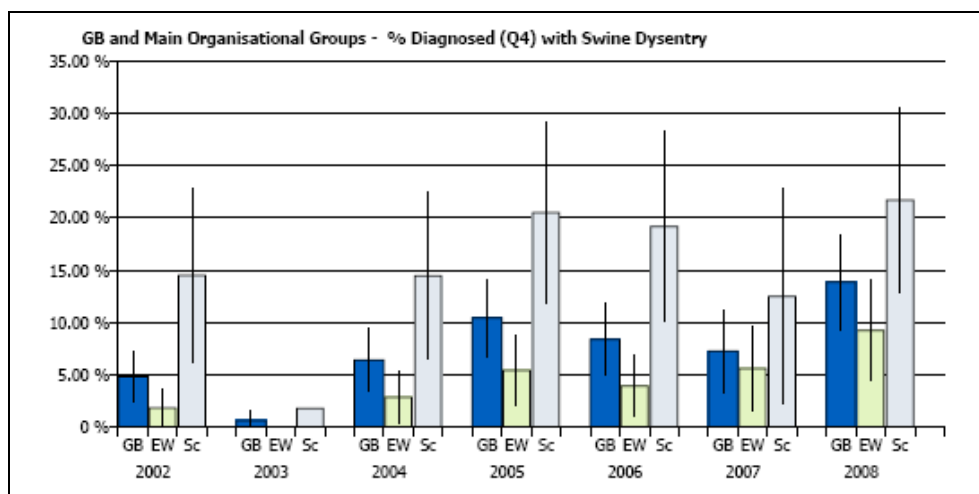
For this report, enteric disease in pigs has been analysed as an example of this type of surveillance.

5.1) Swine Dysentery (*B. Hyodysenteriae*)

5.1.1. SD Trends Q4 2008

There was an increase in the proportion of diagnosable submissions diagnosed with Swine Dysentery (SD) in Scotland England & Wales compared to the same quarter last year (figure 21). Although submission numbers were too low to reach statistical significance the overall GB figure is the highest percentage for Q4 in the past seven years.

Figure 21: Percentage of all porcine diagnosable submissions in Q4 2008, accounted for by swine dysentery since 2002, in Scotland, England and Wales, and both (GB).



Of the confirmed VLA cases, four (31%) were diagnosed from carcase submission; the remainder were diagnosed from submission of faeces. Carcase submissions have the added advantage of detecting other intercurrent infections which this quarter included *Salmonella Derby*, arthritis and *Haemophilus parasuis* pneumonia, all likely to be incidental or secondary findings.

There was a strong geographic bias as 46% of England & Wales diagnoses were located within the VLA Bury St. Edmunds catchment area. There is a growing opinion among those closely involved in the pig industry in East Anglia, confirmed by analysis of available data, that SD is on the increase, which has prompted the inception of the BPEX-sponsored Swine Dysentery Producers' Charter in this region which the VLA has supported (see below).

A noticeable epidemiological feature of most new outbreaks this quarter was a direct or indirect link to SD positive pigs. This was exemplified by two cases in East Anglia, where SD was diagnosed on two all-in, all-out geographically distant fattener units. In the first herd, there was no previous history of infection. Five of 25 22-week-old pigs were seen to pass blood flecked diarrhoea and necropsy of two casualties revealed typical reddened colonic mucosae and bloody intestinal contents. The source of infection was suspected to be a neighbouring SD positive unit which was being depopulated, with wild birds being the likely vectors.

In the second, *Brachyspira hyodysenteriae* was detected by PCR in diarrhoeic faeces from 21-week-old pigs co-infected with *Salmonella Typhimurium*. Although swine dysentery was previously diagnosed in 2006, the unit had since been considered free of disease. Recent infection was strongly suspected to have been re-introduced with pigs supplied from a rearing unit where a shared stockman had also been tending SD positive fatteners.

Figure 22 - Annual rates of diagnosis of swine dysentery as a proportion of diagnosable submissions 2002 to 2008

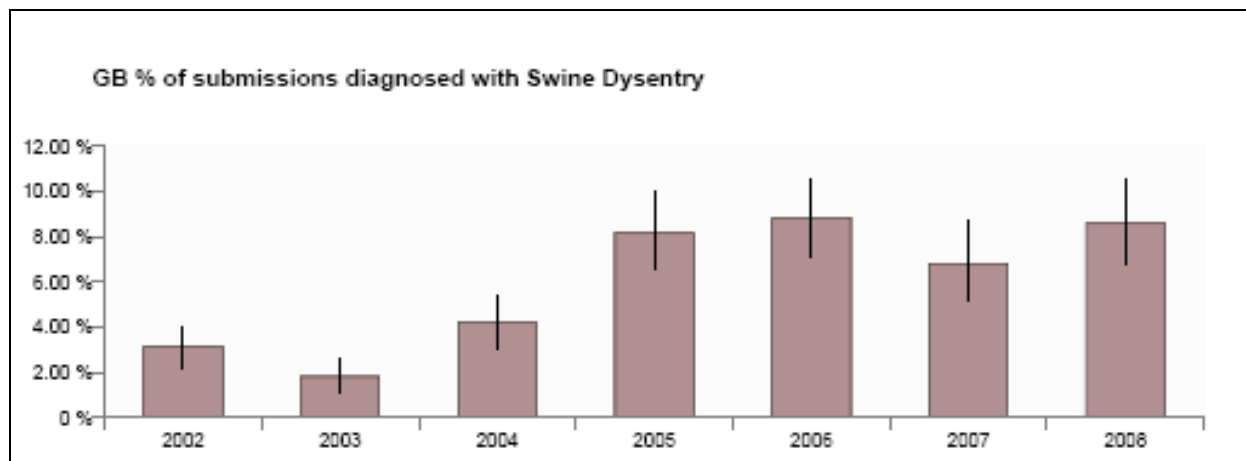
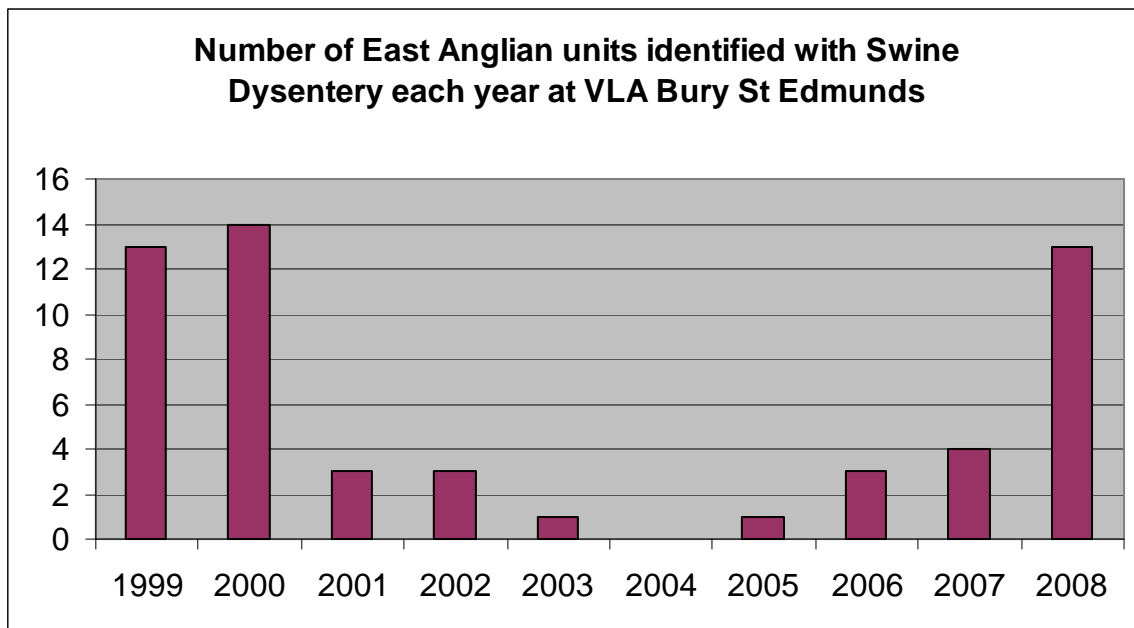


Figure 22 shows the diagnostic rates for swine dysentery in GB since 2002. It shows that a significant rise in diagnostic rates occurred in 2005 which has since been maintained, with only a slight dip in 2007.

These composite GB figures mask sharp regional increases recorded by some VLA Regional Laboratories. At VLA Bury St. Edmunds, for example, the number of diagnoses of SD has increased each year since 2005 contrasting with no diagnoses in 2004 - figure 23).

Figure 23



5.1.3. The Swine Dysentery Producers' Charter

Following a steady increase in SD diagnoses in East Anglia over the past four years, and reports of increased problems in the field (collated by an East Anglia specialist pig veterinary surgeon¹), a joint VLA/BPEX meeting was held at VLA Bury St Edmunds in September 2008 for local pig practitioners and some producers. Pig veterinary experts (Jill Thomson, SAC; Jake Waddilove, Eastgate Veterinary Group; Steve McOrist, University of Nottingham) presented updates on the disease. The discussions which followed resulted in a local initiative for collaboration between pig producers and their veterinary surgeons to share information about where SD is being diagnosed and how it is being spread. The aim is to limit further spread and work towards eradication of the disease from the region. The East Anglian Swine Dysentery Producers' Charter has been produced in collaboration with VLA, BPEX, pig veterinary surgeons, producers and processors. It provides biosecurity guidelines on SD infected units and precautions necessary for visitors. Analysis of data from the current outbreaks suggested that pig movements were responsible for less than half of the 'new' infections. Other significant vectors suspected or proved to be involved included birds, lorries, stockmen, knackermen, farm personnel, agricultural contractors and local spread (rodents, close contact). All these indirect routes of transmission were considered to be preventable by strict attention to basic biosecurity measures.

Reference : Waddilove, J. (2008). Observations of Swine Dysentery in East Anglia 2008. Proceedings of the Pig Veterinary Society Autumn meeting 2008.

Further details are available on the BPEX website, at:
<http://www.bpex.org/SwineDysentery/Default.aspx>

5.1. 4. Continued surveillance of antimicrobial sensitivity of *B. hyodysenteriae* to commonly used antimicrobials.

Concerns were raised in mid 2008 by the identification of an isolate from VLA Thirsk of *B. hyodysenteriae* resistant to all major antimicrobials used in the treatment of SD (tiamulin, valnemulin, lincomycin and tylosin). This was the second multi-resistant isolate to have emerged in Yorkshire in recent years, the other being reported in 2005 (Reichel *et al.* 2005), and concerns have been present concerning resistance to antimicrobials in the pathogenic spirochaetes for much longer (Gresham, A.C.J. *et al.* 1998).

Ongoing surveillance of the antimicrobial sensitivity of field strains of *B. hyodysenteriae* and *B. pilosicoli* is undertaken by VLA Winchester. All isolates which arise from the endemic diseases and welfare project in pigs are batched and tested annually to determine tiamulin MIC values under FZ2200 (the antimicrobial resistance surveillance project). If however there is a suspicion of treatment failure, isolates can be tested on an individual basis at the time of isolation at the VIO's request (three such isolates from 2008 are shown in table 8 below). Tiamulin is the antimicrobial used in the first instance. Because valnemulin and tiamulin are closely related compounds, it is assumed that a tiamulin resistant strain will also show significant valnemulin resistance. Lincomycin and tylosin are no longer routinely tested as part of the surveillance testing programme because previous studies have shown moderate to high resistance to both drugs. There is evidence internationally that MIC values for commonly used antimicrobials are increasing (Cizek A *et al* 2007, Herbst *et al* 2007, Hidalgo *et al* 2007). Management changes aimed at prevention of re-cycling are key in controlling the spread of highly resistant strains. Over-reliance on inappropriate medication will (at best) only delay the development of complete resistance when the farm will be forced to depopulate. Current reports from the field however suggest that in the majority of outbreaks, treatment with appropriately selected licensed antimicrobials is still highly effective.

Table 8 - Three isolates of *B. hyodysenteriae* from 2008 for which MIC values were obtained at the request of the VIO under the endemic diseases project.

Drug	Bury isolate from clinical untreated swine dysentery MIC g/ml	Bury isolate from 'asymptomatic' pigs MIC g/ml	Thirsk resistant isolate (symptomatic pigs) MIC g/ml	Suggested Clinical Break Point*
Tylosin	>200	>200	> 200	>4
Tiamulin	1.0	0.25	32 - 64	>4
Lincomycin	100	5.0	200	>36
Valmemulin	0.031	0.125	16.0	-

*Clinical resistance breakpoints are those suggested by Rønne and Szancer, 1990.

References

Cizek, A., Prasek, J. & Smola, J. (2007) Antibiotic sensitivity of *Brachyspira hyodysenteriae* isolates from Czech pig farms: A 10-year follow up study. *Proc. Fourth International Conference on colonic spirochaetal infections in humans and animals (Abs. 16)* .

Herbst, W., Schlez, K., Heuser, J. & Baljer, G. (2007) Detection Rates by PCR of *Brachyspira hyodysenteriae* in German pigs and antimicrobial susceptibility of *Brachyspira* species isolates. *Proc. Fourth International Conference on colonic spirochaetal infections in humans and animals (Abs. 15)*.

Hidalgo, A., Garcia, K., Osorio, J., Naharro, G., Carvajal, A., Rubio, P.(2007) Sensitivity to Spanish *Brachyspira hyodysenteriae* isolates. *Proc. Fourth International Conference on colonic spirochaetal infections in humans and animals (Abs. 20)* .

Gresham, A.C.J, Hunt, B.W & Dalziel, R.W. (1998) Treatment of swine dysentery-problems of antibiotic resistance and concurrent salmonellosis. *Veterinary Record*, 143 (22), 619.

Reichel, R., Gaudie, C.M., Teale, C. & Done, S.H. (2006) Swine Dysentery and antibiotic resistance. *The Pig Journal* 58, 212-218.

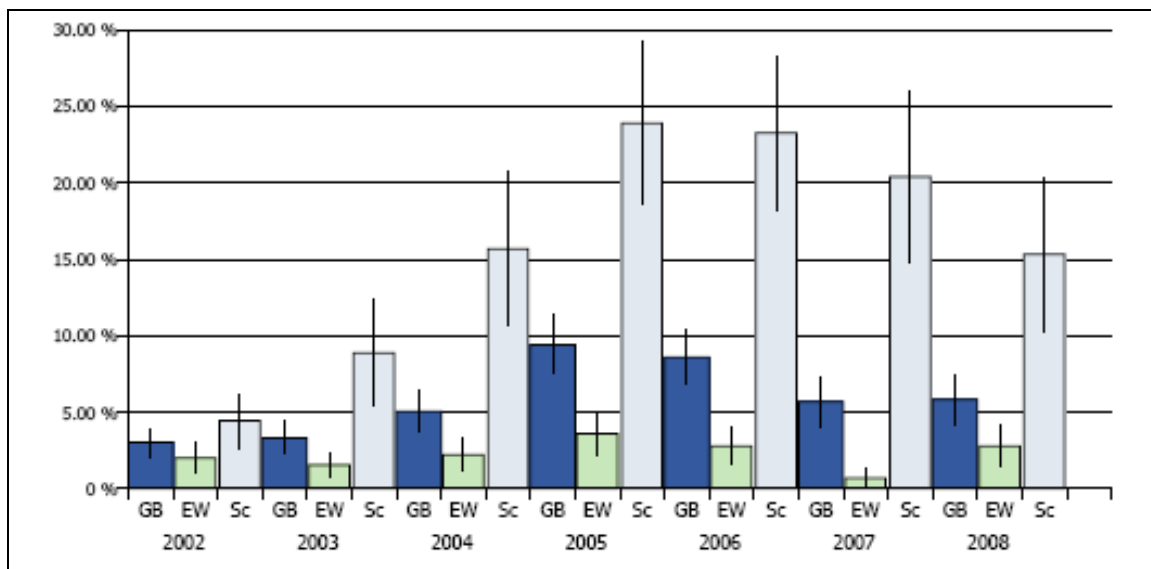
Ronne, H & Szancer, J. (1990). In vitro susceptibility of Danish field isolates of *treponema hyodysenteriae* to chemotherapeutics in swine dysentery (SD) therapy. Interpretation of MIC results based on the pharmacokinetic properties of the antibacterial agents. *Proc. International Pig Veterinary Society, 11th Congress, Lausanne, Switzerland*, p. 126

5.2) *Lawsonia intracellularis* infections

Lawsonia intracellularis is known to be widely distributed in UK pig herds but is often sub-clinical.

As figure 24 shows, the annual diagnosis rate of Porcine Proliferative Enteropathy (PPE) has been gradually declining in Scotland (without statistical significance) but not England and Wales since peaking in 2005.

Figure 24: Annual rates of diagnosis of PPE due to *Lawsonia intracellularis* as a proportion of diagnosable submissions, since 2002.



Some of this decrease may be associated with the introduction of an oral live attenuated vaccine (Enterisol ileitis, Boehringer Ingelheim). Alternatively, as the disease presents with clinical signs which can resemble PCVD, it may be that pigs with this presentation between 2005 and 2008 were not further investigated (by farmers) who arrived at a presumptive diagnosis of PMWS.

Diagnostic rates are higher in Scotland however this may be an aberrant finding due to the use of a different profile of diagnostic testing available rather than an actual increase in disease rate. Significant seasonal trends are not apparent with PPE (data not shown).

Anecdotal reports suggest that some farmers have chosen to concentrate on vaccination against PCV2, in the hope that by reducing the viral challenge from PCV2, pigs will be able to deal better with PPE. This is a risky approach because *Lawsonia species* infection is often a subtle disease with apparently healthy non scouring pigs suffering significant growth checks as a result of subclinical ileitis. Increased level of PPE may occur in the future when the improved health status of growers/fatteners as a result of PCV2 vaccination leads to a reduction of prophylactic in-feed antimicrobial medication such as chlortetracycline, which remains effective against *Lawsonia intracellularis*. The following two examples demonstrate that clinically evident PPE still usually presents as an uncomplicated primary disease, and is often diagnosed when PCVD has been initially suspected clinically.

Live eight-week-old piglets were submitted from a 60 sow breeding and fattening unit with a history of wasting, diarrhoea and recent deaths. Necropsy revealed thickening of the lower small intestine with lesions extending into the caecum/colon. Intracellular organisms resembling *Lawsonia intracellularis*, were demonstrated in direct mucosal smears. There was no evidence of underlying PMWS.

PPE was shown to be the cause of wasting in fatteners from 17 weeks of age in a 550-sow indoor breeder finisher unit. Approximately eight pigs were clinically affected in each batch of 400, and about half of these died. Sow vaccination for PCV2 began in 2007 and its use coincided with a drop in post weaning mortality from 7% to 4%. When mortality started to creep back up to 6%, there was concern that it indicated a recrudescence of PMWS. In all six typical cases examined the distal third of the small intestine variably thickened and corrugated with some additionally showing multifocal diphtheresis or more diffuse necrotic enteritis. The mucosa of the caecum and colon was also somewhat thickened and cores of rubbery yellow cast like material were present in the caecal lumina. Once again, curved acid fast rods were visible in MZN-stained intestinal smears consistent with *Lawsonia intracellularis* infection. PCV2-associated lesions were not found in the lymph nodes or intestines.

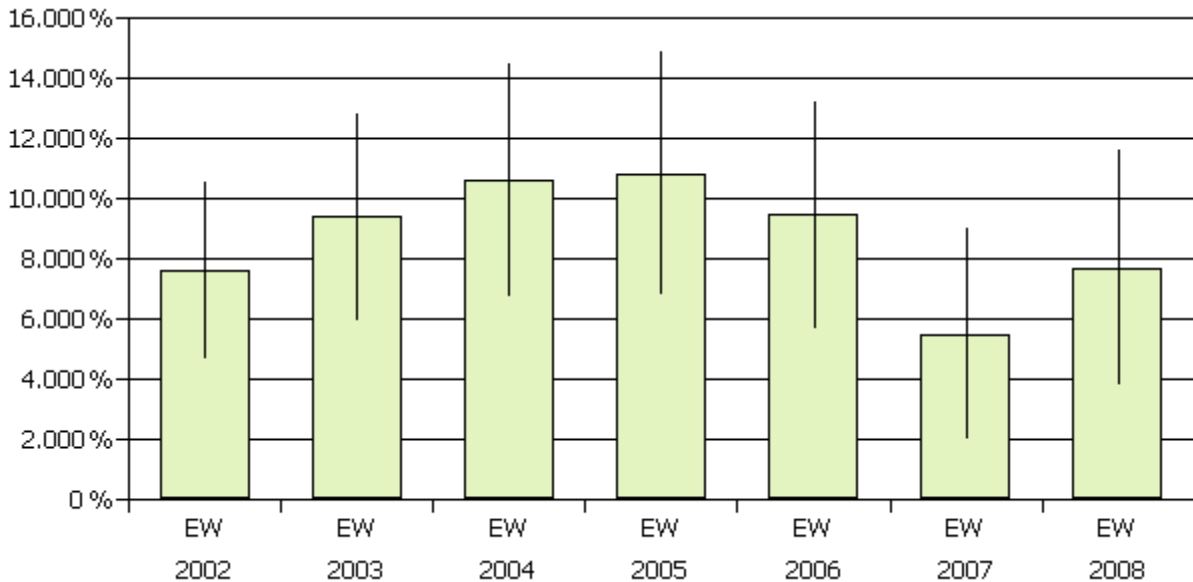
5.3) Enteric colibacillosis

Colibacillosis:

Fourteen diagnoses of colibacillosis were made this quarter in England and Wales, which equates to 7.69% of submissions tested. Figure 25 shows no statistical differences in the prevalence of this condition over this quarter in the last six years.

Figure 25: % of submissions tested and diagnosed with E. coli in Q4 in England and Wales from 2002 to 2008.

(Vertical bars indicate 95% confidence limits)

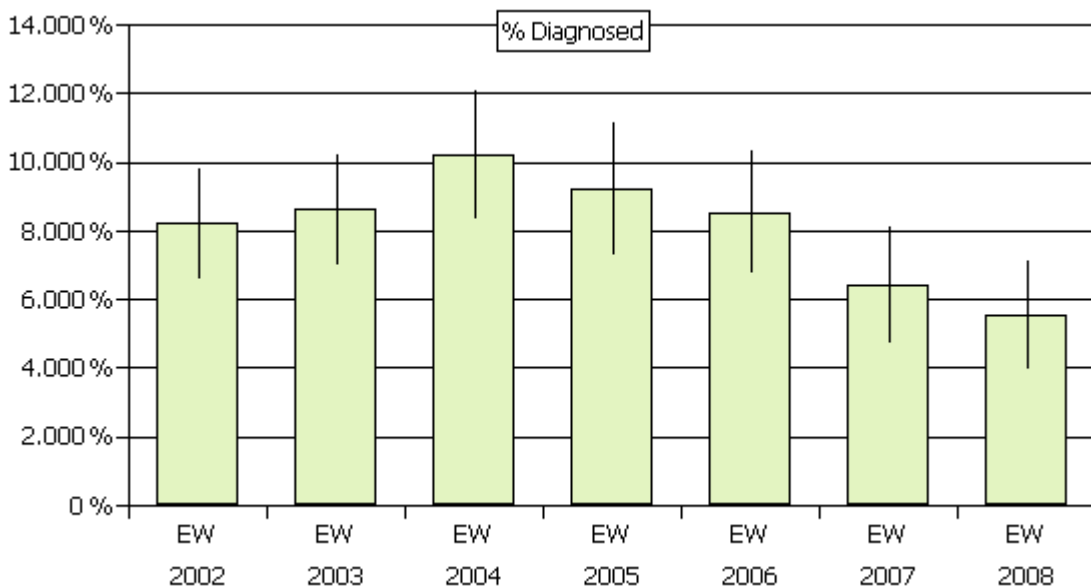


Two of the cases diagnosed involved pre-weaned pigs on organic units one of which was diagnosed with serotype O45:KE65 which is more commonly associated with oedema disease in weaned pigs. The other organic case involved serotype O45ac:KE65K88ac which produces both heat stable and heat labile toxins. Both cases affected four-week-old pigs within one week of them gaining access to outdoor paddocks.

Looking at the annual figures for E. coli diagnoses (figure 26) it can be seen that there is a statistically significant decrease in cases diagnosed in 2008 compared with 2004 and 2005 this may again be related to the use of PCV2 vaccines.

Figure 26: Annual % of submissions tested diagnosed with E. coli in England and Wales.

(Vertical bars indicate 95% confidence limits)



5.4) Neonatal Enteric Disease

Neonatal enteric disease (Rotavirus, *Clostridium perfringens* type A enteritis, *Clostridium perfringens* type C enteritis, coccidiosis):

Rotavirus was diagnosed twice this quarter. In both cases colibacillosis was also diagnosed which was likely to have been the consequence of severe viral intestinal damage.

Three diagnoses of coccidiosis were achieved. Two were based on histological examination of fresh gut tissue and the third was made by coccidial oocyst count on faecal samples. One of the post mortem material cases identified concurrent iron deficiency anaemia in the piglets ranging from 4-days-old up to 28 days. This may have been the result of failed prophylactic iron treatment or secondary to intestinal bleeding from damaged mucosal surfaces.

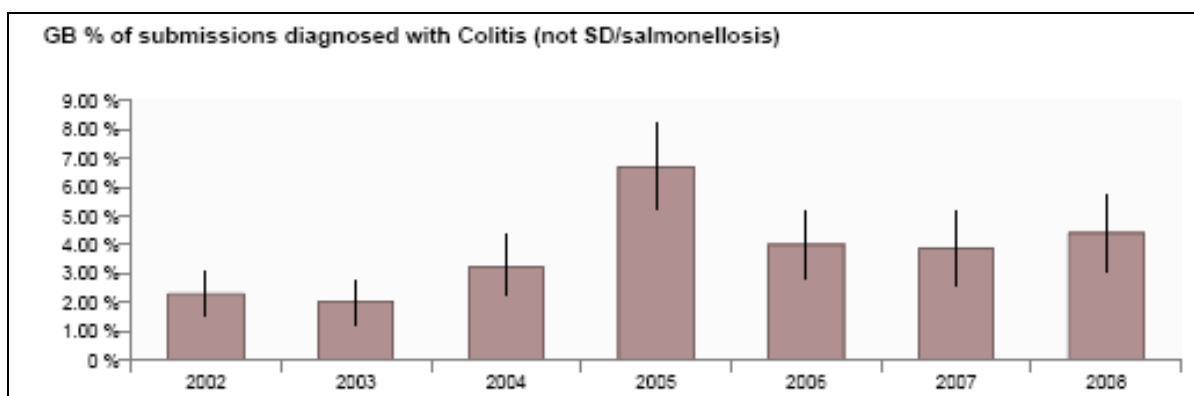
One case of neonatal scour investigated identified both rotavirus and coccidiosis infection thought to be the result of poor hygiene in the farrowing accommodation and in association with low ZST values, indicating poor colostral transfer of immunoglobulin.

Clostridium perfringens type A enteritis was diagnosed twice on the basis of clinical signs and histological examination of intestines. Both cases involved two-day-old piglets.

Clostridium perfringens type C enteritis was also diagnosed twice this quarter, once in four, 5-day-old piglets from two of which alpha toxin was identified in gut contents. The third pig had alpha and beta toxins detected in its gut contents and no toxins were detected in the fourth. The second case of *Clostridium perfringens* type C enteritis was unusually diagnosed in a post-weaned pig. Histology revealed a chronic fibrosing interstitial hepatitis and acute multifocal necrotising hepatitis. The liver damage may well have predisposed the animal to clostridial invasion. Alpha and epsilon toxins were detected in this case.

5.5) Colitis not due to swine dysentery or salmonellosis

Figure 27: Annual GB rates of colitis as a proportion of diagnosable submissions 2002 to 2008



Rates of diagnosis of colitis in pigs have remained constant since 2006 (figure 27). Six diagnoses of porcine intestinal spirochaetosis (PIS) associated with *B. pilisicoli* infection were made in the last quarter of 2008. It remains a significant production-limiting disease but trends in its presentation are not evident in recent years.

Non specific colitis was diagnosed only four times in 2008.

5.6) Gastric Ulceration

Five diagnoses of gastric ulceration in pigs were made in the last quarter of 2008, all from carcase submissions. In two cases, concurrent disease processes were identified (metritis in one case; PRRSv and *P. multocida* pneumonia in the other), which may have predisposed to or exacerbated the gastric ulceration.

When the disease affects a group of pigs, clinical manifestations can resemble PCVD, as was demonstrated by one submission of pale wasted ten-week-old rearing pigs. Wasting disease consistent with circovirus infection approximately a year earlier had responded to circoviral vaccination. In July 2008 clinical problems had re-occurred with an increase in morbidity, illthrift and paleness in approximately 5-10% of the last two batches of 300 fatteners. Gastric ulceration was found in all three pigs submitted and haematology demonstrated a regenerative anaemia, consistent with chronic haemorrhage from the gastric ulcers. Histopathology and IHC ruled out any involvement of PMWS and PRRSv.

Following a herd diagnosis of gastric ulceration investigations should always include an assessment of adverse husbandry and dietary factors. Fine particle size, high wheat content and pelleting may increase the risk, while larger particle size (such as may be achieved through rolling), barley and oats are thought to be more protective. The expected benefits of effective vaccination against circovirus may be offset when appetites are increased and there is more competition at the feed trough, leading to gorging, which can be ulcerogenic. In contrast, better control of intercurrent disease (stressors) will tend to reduce the incidence. If producers decide to alter the specifications of rations to capitalise on an improved disease situation (and better average daily gains), careful monitoring will be necessary in order to minimise the risks of gastric ulceration in such pigs.

In total in 2008, sixteen diagnoses of gastric ulceration were made. Most were sporadic and responded well to appropriate interventions.

5.7) Helminthiasis

In line with the increasing numbers of outdoor and organic pigs seen by Regional Laboratories, diagnoses of helminthiasis have tended to increase in recent years (data not shown), and smaller herds have been over-represented. The importance of formulating a worm control plan with a veterinary surgeon in these circumstances is emphasised, as helminthiasis should be one of the easier diseases to control with available therapies.

This quarter, three adult pigs were submitted from a 140-animal rare breed herd in which six adult pigs had died in the last month. The animals had remained bright but progressively lost weight sometimes becoming inco-ordinated before dying in an emaciated condition. Although some had mild pneumonia and peritonitis at necropsy, the consistent finding was large numbers of *Oesophagostomum* species in the colon. Oesophagostomiasis can be a significant cause of illthrift and poor productivity but is infrequently seen in the UK especially in housed pigs. However, the findings in this present case suggested that parasitism was a primary cause of death necessitating the implementation of an effective worming programme on the farm.

5.8) Intestinal Torsion

None diagnosed this quarter. Diagnosed sporadically throughout the year, usually as a direct result of inappropriate feeding regimes.

6) SCANNING SURVEILLANCE FOR NEW AND EMERGING DISEASES IN PIGS

Monitoring the trends in diagnoses of known diseases cannot, by definition, detect either new diseases, or changes in endemic diseases that would prevent a diagnosis from being reached (for example a change in the pathogen that compromised the usual diagnostic test). Such new or emerging diseases would likely first be detected by observation of increased numbers of clinical and/or pathological syndromes for which a diagnosis could not be reached in the normal way. Such submissions are regularly analysed to look for changes that could indicate the presence of a new or emerging disease, which may be reflected by an increase in undiagnosed disease. Undiagnosed disease submissions are summarised broadly by the clinical presentation of disease and, once this has been determined by further investigation, the body system affected. Both groups are investigated and trends in the levels are compared over time.

This approach has been developed and refined over recent years and such analyses are now possible for data from GB.

The following is a summary of pig data analysed by VLA and SAC from diagnostic samples submitted to Regional Laboratories. The aim of this report is to review data where a diagnosis was not reached despite the sample receiving "reasonable" testing. This allows monitoring of this class with the aim of providing information on new or emerging syndromes.

It should be noted that VLA reports prior to 2005 on undiagnosed submissions included submissions which received both adequate and limited testing. Comparisons between the figures within this report should bear this in mind. 'Prior years' refers to pooled data for years 2003-2007 for VLA only data, and to data for 2007 for GB DNR analysis.

Overall GB DNR rates

- The overall percentage of GB pig diagnostic submissions from VIDA for the 12 months of 2008 (to fourth quarter, Q4) where a diagnosis was not reached (DNR) was 16.4% (174/1058). This was not significantly increased from data to Q4 for 2007 in which DNR was 15.9%. SAC and VLA data were similar with overall DNR rates of 14.9% and 17.0 % respectively.
- The overall DNR rate for the fourth quarter of 2008 was not significantly increased from the previous quarter (Q3, 2008) DNR, or from the DNR for the equivalent quarter (Q4) in 2007.
- In the 12 months of 2008, there was a significant increase in undiagnosed disease for VLA submissions for nervous sensory syndrome to 19.2% (9/47) compared to 4.8% (2/42) for 2007. GB and SAC DNR for nervous sensory syndrome were not significantly increased.
- In the 12 months of 2008, there was a significant increase in undiagnosed disease for GB for submissions with a presenting sign of abortion; 77.1% DNR (37/48) compared to 54.1% in 2007. Separated data for SAC and VLA did not indicate significant increases.
- Tables 10, and 11 give GB DNR rates by syndrome and presenting sign to Q4 2008 compared to 2007.

Increased DNR for nervous/sensory syndrome: VLA data

- The significant increase in DNR for VLA submissions for nervous-sensory syndrome (see table 12) was investigated by reviewing the nine undiagnosed cases:
 - The submissions were from seven different RLs, only one was an RL in a main pig producing area (Thirsk)
 - Submissions were distributed in all four quarters of 2008
 - Ages were mixed; two preweaned, six postweaned and one young adult
 - Two were cases of lymphoplasmacytic encephalitis/encephalomyelitis in 7-8 week old pigs from a unit which has since been the subject of a 5 day investigation detailed previously in which porcine enterovirus infection was diagnosed.
 - One was suspected water deprivation in outdoor 7-8 week old pigs, although histopathology was not quite typical, no further cases were submitted.
 - One was suspected meningitis in an 11-week-old pig. There was gross evidence of pneumonia and meningitis but no bacteria were isolated, probably because the pig had been treated with antibiotics.
 - One submission consisted only of samples for culture, thus testing limited.
 - Histopathology in one submission of piglets trembling from birth was compatible with congenital tremor A2
 - Three cases remain which were undiagnosed – one dead 2-3 week-old pig submitted had no histopathological lesions in the brain suggesting that it may not have been representative of the farm problem of 6/400 affected with tremor and convulsions with 3 deaths and good response to antibiotics in others; the second was a 25 week old gilt where the cause of neurological signs and lateral recumbency was not established, only one gilt was affected, brain histopathology was unremarkable, autolysis prevented interpretation of spinal cord histopathology; and in the third, *Brachyspira pilosicoli* colitis was diagnosed with no neuropathological lesions to explain fitting and deaths in 3 of 4 11 week-old recently purchased pigs.
- There is no evidence of common features in these submissions to suggest the emergence of a new nervous disease.
- There was no corresponding increase in the DNR for VLA submissions with nervous signs as the presenting sign.
- All 14 submissions to SAC for nervous/sensory syndrome were diagnosed.

Increased DNR for abortion as a presenting sign: GB VIDA data

The significant increase in DNR for GB VIDA data for submissions where abortion was the presenting sign was investigated by reviewing undiagnosed VLA cases (both undiagnosed cases of reproductive syndrome and where abortion was the presenting sign), see table 9.

Table 9: Analysis of DNR foetal submission in the fourth quarter of 2008

Possible reason for DNR	Number of submissions	Comments
No fetal/carcass material submitted	7	Bloods, vaginal swabs, testes or uteri submitted
Fetal autolysis	1	Aborted fetuses
Possible maternal cause – delay in parturition	1	Stillbirths
PRRSV not detected in aborted fetuses	1	PRRSV breakdown in herd later confirmed
Limited laboratory testing	1	Rare breed sow – litter of 12, 10 stillborn
Diagnosis made	2 (linked)	Porcine parvovirus detected in mummified piglets
No reason evident – reasonable testing and only 1-2 fetuses/piglets received	6	4 units abortions 2 units - stillbirths
No reason evident – reasonable testing and >2 fetuses/piglets received	22	12 units - abortion 4 units - stillbirths or nonviable piglets 1 unit - poor litter sizes

Forty one undiagnosed submissions were reviewed. Twenty eight had reasonable testing on submitted material but, in six of these, only 1-2 foetuses or piglets were submitted. Twenty two submission had reasonable testing on more than two foetuses/piglets and no obvious reason for no diagnosis being reached.

- Reasons why diagnoses may not be made and for the higher DNR for reproductive syndrome compared to others have been outlined by Bidewell and others (Pig Journal, volume 56, 88-106). The poor diagnostic rate for submissions of foetuses/stillborn piglets in part reflects the fact that laboratory investigations are geared to diagnosing infectious disease. In pigs, non-infectious disease and management problems are prominent amongst the causes of reproductive disease and can only be adequately assessed by on-farm investigations supplemented with laboratory submissions to rule out infectious disease. In addition, even where reproductive disease has an infectious cause, diagnosis of some of these remains problematic. Autolysis is common in aborted foetuses and affects test sensitivity. Other pathogens e.g. PRRSV may no longer be detectable by the time the foetopathy manifests as abortion, stillbirth or weak neonatal piglets. For this reason, multiple submissions are encouraged from herds to increase the chances of achieving a diagnosis.
- The DNR increase does not relate to any particular region. Housed and outdoor pigs are both represented, as are small rare breed farms and commercial breeding units.
- There was no corresponding increase in the DNR for submissions for reproductive syndrome for GB, VLA or SAC data. DNR for reproductive syndrome for 2008 was 73.5% (50/68) compared to 60.4% (29/48) for 2007.

Table 10 VIDA (GB) Overall Changes in DNR rates for Pigs by Presenting Sign to Q4 for 2008 and prior years (2007)

Presenting Sign	Overall			Prior years			2008			diff	SE Yr-Yr	z
	DNR	Subs	% DNR	DNR	Subs	% DNR	DNR	Subs	% DNR			
	0	2	0.00 %	0	2	0.00 %	0	0		0.00 %		
ABORTION	57	85	67.06 %	20	37	54.05 %	37	48	77.08 %	23.03 %	10.28 %	2.24
DIARRHOEA	93	444	20.95 %	50	227	22.03 %	43	217	19.82 %	-2.21 %	3.86 %	-0.57
EYE	0	2	0.00 %	0	0		0	2	0.00 %	0.00 %		
FNDDEAD	46	398	11.56 %	24	201	11.94 %	22	197	11.17 %	-0.77 %	3.21 %	-0.24
GIT_XDIARR	4	20	20.00 %	1	8	12.50 %	3	12	25.00 %	12.50 %		
HEALTHY	1	11	9.09 %	0	9	0.00 %	1	2	50.00 %	50.00 %		
LAME	8	73	10.96 %	3	30	10.00 %	5	43	11.63 %	1.63 %	7.43 %	0.22
MALAISE	16	88	18.18 %	7	44	15.91 %	9	44	20.45 %	4.55 %	8.22 %	0.55
MASTCLIN	0	4	0.00 %	0	1	0.00 %	0	3	0.00 %	0.00 %		
MILKDROP	0	1	0.00 %	0	1	0.00 %	0	0		0.00 %		
MUSC_SKEL	2	11	18.18 %	2	8	25.00 %	0	3	0.00 %	-25.00 %		
NERVOUS	9	73	12.33 %	5	34	14.71 %	4	39	10.26 %	-4.45 %	7.71 %	-0.58
OTHER	26	221	11.76 %	11	102	10.78 %	15	119	12.61 %	1.82 %	4.35 %	0.42
RECUMBT	3	27	11.11 %	1	14	7.14 %	2	13	15.38 %	8.24 %		
REPRO	13	28	46.43 %	4	8	50.00 %	9	20	45.00 %	-5.00 %		
RESPIR	14	209	6.70 %	8	104	7.69 %	6	105	5.71 %	-1.98 %	3.46 %	-0.57
SKIN	7	49	14.29 %	4	24	16.67 %	3	25	12.00 %	-4.67 %	10.00 %	-0.47
UNKNOWN	23	157	14.65 %	15	85	17.65 %	8	72	11.11 %	-6.54 %	5.66 %	-1.15
URINARY	0	1	0.00 %	0	1	0.00 %	0	0		0.00 %		
WASTING	17	191	8.90 %	10	97	10.31 %	7	94	7.45 %	-2.86 %	4.12 %	-0.69
	338	2,095	16.18 %	165	1,037	15.91 %	174	1,058	16.4 %	0.53 %	1.51 %	0.33

The red highlighting of 'abortion' indicates a significant increase in DNR for this presenting sign compared to prior years.

Table 11 VIDA (GB) Overall Changes in DNR rates for Pigs by Syndrome to Q4 for 2008 and prior years

GB Syndrome	Overall			Prior years (2007 only)			2008			diff	SE Yr - Yr	z
	DNR	Subs	% DNR	DNR	Subs	% DNR	DNR	Subs	% DNR			
Circulatory	3	50	6.00 %	2	29	6.90 %	1	21	4.76 %	-2.13 %	6.80 %	-0.31
Enteric	119	707	16.83 %	56	342	16.37 %	63	365	17.26 %	0.89 %	2.82 %	0.31
Mastitis	0	4	0.00 %	0	1	0.00 %	0	3	0.00 %	0.00 %		
Musculo-skeletal	8	95	8.42 %	4	41	9.76 %	4	54	7.41 %	-2.35 %	5.75 %	-0.41
Nervous / Sensory	12	111	10.81 %	3	50	6.00 %	9	61	14.75 %	8.75 %	5.92 %	1.48
Reproductive	79	116	68.10 %	29	48	60.42 %	50	68	73.53 %	13.11 %	8.79 %	1.49
Respiratory	18	396	4.52 %	11	192	5.73 %	7	206	3.40 %	-2.33 %	2.08 %	-1.12
Skin	6	61	9.84 %	5	29	17.24 %	1	32	3.13 %	-14.12 %	7.64 %	-1.85
Systemic & Misc	60	753	7.97 %	34	375	9.07 %	26	378	6.88 %	-2.19 %	1.97 %	-1.11
Unknown (999,990,991,980,970)	33	39	84.62 %	21	24	87.50 %	12	15	80.00 %	-7.50 %		
Urinary	1	17	5.88 %	0	8	0.00 %	1	9	11.11 %	11.11 %		

Table 12 VIDA Overall Changes in DNR rates for SAC and VLA for Pigs by Syndrome in Q4 for 2008 and prior years**SAC**

Syndrome	Overall			Prior years (2007 only)			2008			diff	SE Yr - Yr	z
	DNR	Subs	% DNR	DNR	Subs	% DNR	DNR	Subs	% DNR			
Circulatory	2	19	10.53 %	1	14	7.14 %	1	5	20.00 %	12.86 %		
Enteric	32	247	12.96 %	13	118	11.02 %	19	129	14.73 %	3.71 %	4.28 %	0.87
Musculo-skeletal	3	18	16.67 %	2	9	22.22 %	1	9	11.11 %	-11.11 %		
Nervous / Sensory	1	22	4.55 %	1	8	12.50 %	0	14	0.00 %	-12.50 %		
Reproductive	9	14	64.29 %	2	5	40.00 %	7	9	77.78 %	37.78 %		
Respiratory	6	114	5.26 %	4	58	6.90 %	2	56	3.57 %	-3.33 %	4.18 %	-0.79
Skin	0	23	0.00 %	0	9	0.00 %	0	14	0.00 %	0.00 %		
Systemic & Misc	8	144	5.56 %	3	66	4.55 %	5	78	6.41 %	1.86 %	3.83 %	0.49
Unknown (999,990,991,980,970)	15	19	78.95 %	7	8	87.50 %	8	11	72.73 %	-14.77 %		
Urinary	0	4	0.00 %	0	3	0.00 %	0	1	0.00 %	0.00 %		

VLA

Syndrome	Overall			Prior years (2007 only)			2008			diff	SE Yr - Yr	z
	DNR	Subs	% DNR	DNR	Subs	% DNR	DNR	Subs	% DNR			
Circulatory	1	31	3.23 %	1	15	6.67 %	0	16	0.00 %	-6.67 %		
Enteric	87	460	18.91 %	43	224	19.20 %	44	236	18.64 %	-0.56 %	3.66 %	-0.15
Mastitis	0	4	0.00 %	0	1	0.00 %	0	3	0.00 %	0.00 %		
Musculo-skeletal	5	77	6.49 %	2	32	6.25 %	3	45	6.67 %	0.42 %	5.70 %	0.07
Nervous / Sensory	11	89	12.36 %	2	42	4.76 %	9	47	19.15 %	14.39 %	6.99 %	2.06
Reproductive	70	102	68.63 %	27	43	62.79 %	43	59	72.88 %	10.09 %	9.30 %	1.06
Respiratory	12	284	4.23 %	7	134	5.22 %	5	150	3.33 %	-1.89 %	2.39 %	-0.79
Skin	6	38	15.79 %	5	20	25.00 %	1	18	5.56 %	-19.44 %		
Systemic & Misc	52	609	8.54 %	31	309	10.03 %	21	300	7.00 %	-3.03 %	2.27 %	-1.34
Unknown (999,990,991,980,970)	18	20	90.00 %	14	16	87.50 %	4	4	100.00 %	12.50 %		
Urinary	1	13	7.69 %	0	5	0.00 %	1	8	12.50 %	12.50 %		

The red highlighting of 'nervous/sensory' indicates a significant increase in DNR for this syndrome sign compared to prior years.