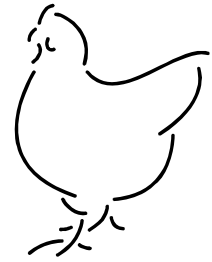


Surveillance Report Avian



Quarterly Report Vol 12 No 2

April – June 2008

August 2008

HIGHLIGHTS:

- ◆ DESCRIPTION OF HIGHLY PATHOGENIC AVIAN INFLUENZA H7N7 OUTBREAK (PAGE 3)
- ◆ THE SECOND UK ISOLATION OF INFECTIOUS BRONCHITIS VIRUS QX STRAIN (PAGE 9)

| CONTENTS | Page No |
|---|-----------|
| OVERVIEW | 1 |
| POULTRY STATISTICS | 2 |
| NOTIFIABLE DISEASE | 3 |
| SUBMISSIONS TO THE EU REFERENCE LABORATORY | 7 |
| FOOD SAFETY AND ZOOSES | 8 |
| FOOD SAFETY | 8 |
| SALMONELLA REPORT | 8 |
| VACCINAL STRAINS OF S. ENTERITIDIS | 9 |
| SALMONELLA ZO4 VISITS | 9 |
| ENDEMIC/NEW AND EMERGING DISEASE SURVEILLANCE | 9 |
| VIROLOGY REPORT | 9 |
| OTHER AVIAN TOPICS | 11 |
| FOWL CHOLERA | 11 |
| BLACKHEAD UPDATE | 11 |
| MAREK'S DISEASE | 11 |
| APPENDIX 1: VLA BURY AVIAN HISTOPATHOLOGY SUBMISSIONS JAN – JUNE 08 | 12 |

OVERVIEW

Following the rise in feed costs highlighted in the previous quarterly report (Vol 12 N° 1), "Poultry World" reported that the price of basic layer ration rose to £233/tonne in April (compared with £136/tonne in April 2007), before easing back in May as a result of declines in the price of wheat and soya.

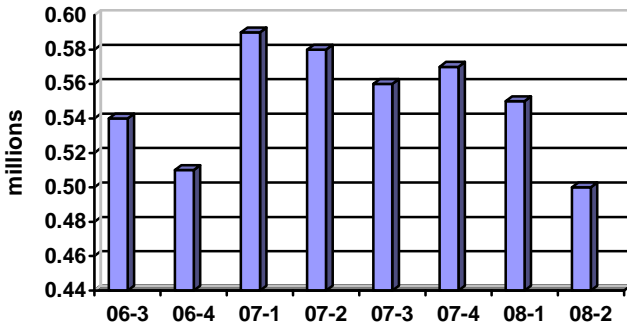
If the decline is sustained it will be beneficial in reducing the impact of high food costs in the industry. Another welcome development has been a small increase in turkey poult placings in the quarter compared with last year, as shown on page 2 of this report.

In terms of disease the quarter was dominated by the outbreak in June of Highly Pathogenic Avian Influenza H7N7 in a free range layer flock. A description of the outbreak is given on pages 3 to 5 of this report

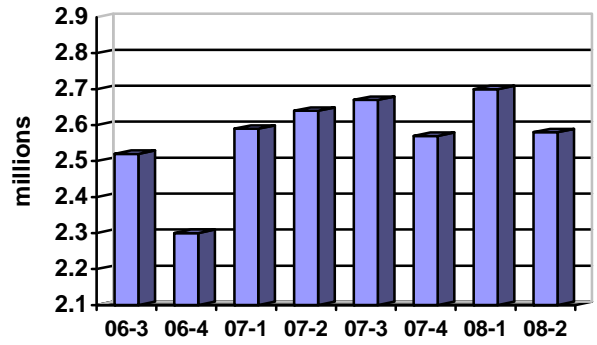
The ingestion of lead shot by waterfowl is well documented but toxicity in poultry is more unusual. The consequences of exposure of a free range layer flock to lead contaminated soil adjacent to a clay pigeon shoot are summarised on page 8 of this report. The presenting feature of the incident was poor egg production in the flock.

POULTRY STATISTICS

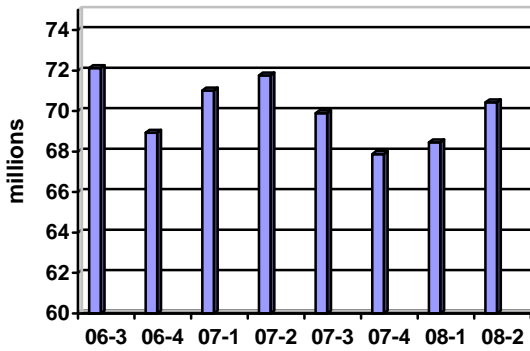
UK Quarterly figs for female Broiler Parent Chick Placings (Average Monthly figures)



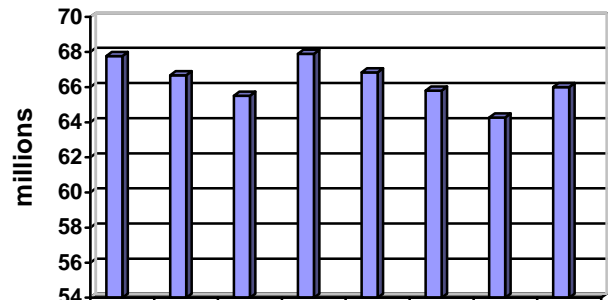
Av UK Quarterly figs for Commercial Layer Chick Placings (Average Monthly figures)



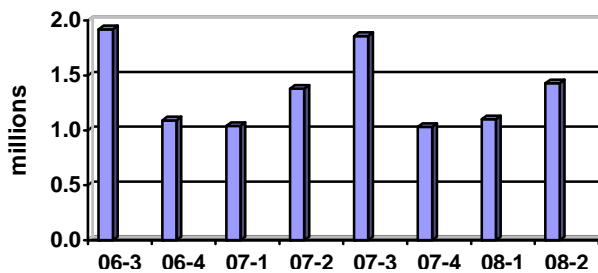
UK Quarterly figs for Commercial Broiler Chick Placings (Average Monthly figures)



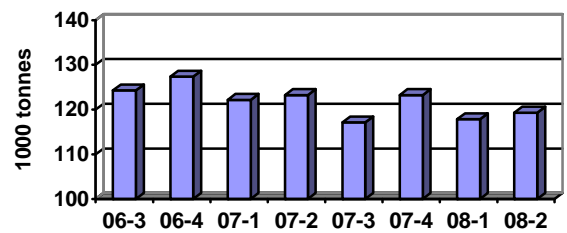
UK Quarterly figs for Broiler Slaughterings (Average monthly figures)



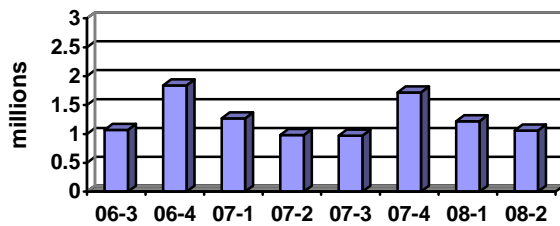
UK Quarterly figs for Turkey Poult Placings (Average Monthly figures)



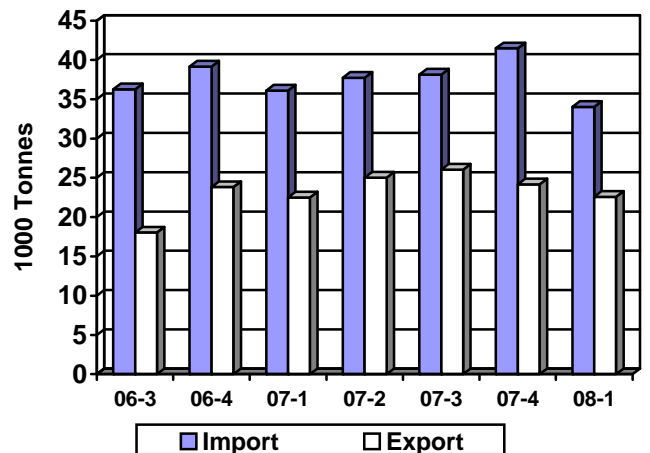
Total UK poultry meat production (Average monthly figures)



UK Quarterly Figs for Turkey Slaughterings (Average monthly figures)



Total Poultry Meat Trade (Average Monthly figures) *



These statistics may be found at <https://statistics.defra.gov.uk/esg/statnot/ppntc.pdf> . The data for the latest quarter may be subject to revision.

NOTIFIABLE DISEASE
Virology, VLA Weybridge

An outbreak of Highly Pathogenic Avian Influenza (HPAI) H7N7 affecting a free-range layer premises in Oxfordshire was confirmed by Defra on 4 June 2008. The infected premises (IP) comprised approximately 25,000 hens aged 29-30 weeks, divided between three mobile houses of 3,000 birds each (Sheds 1 – 3) and a single building (Shed 4) of 16,000 laying hens. In addition, at the time of the outbreak thirty mallard ducks, reared for sport shooting, were present on the IP, residing on a pond close to Shed 1. Five pigs were also present.

Suspected avian notifiable disease was reported on 2 June 2008, and the report stated that two weeks earlier lethargy, an increased mortality rate and egg drop had been noted in one of the four groups (Shed 1) of birds (Fig 1). Although this group appeared to recover following treatment with chlortetracycline, in the previous four days sick and dying birds (Fig 2) and an egg drop had been seen in the three other groups. Sick birds were noted to be lethargic, pyrexemic, with swollen combs and wattles (some cyanotic), watery white diarrhoea, sticky mucus in the mouth and a few birds with haemorrhages on their legs (Defra, 2008a).

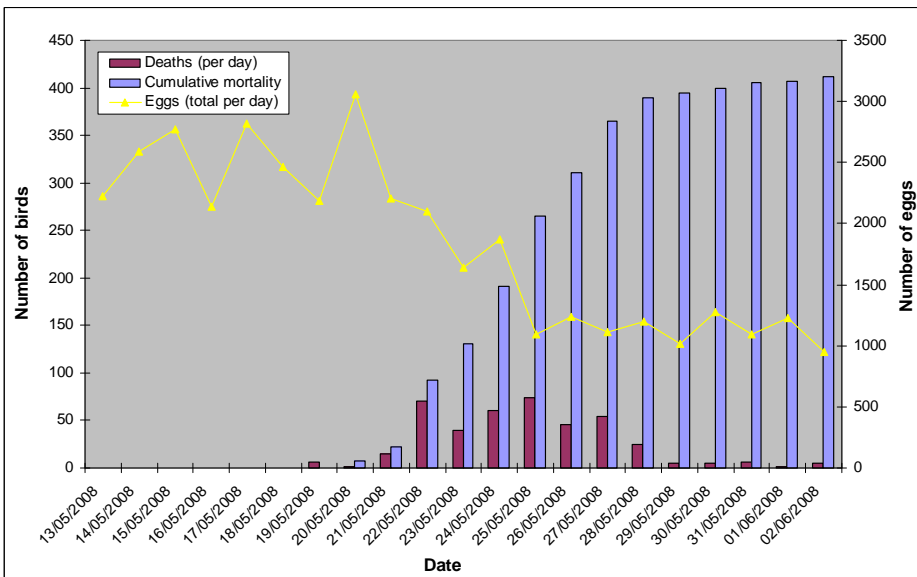


Fig 1: Shed 1 egg production and daily and cumulative mortality records (13 May - 02 June 2008). Note that egg collections did not take place at the same time each day, which may account for some of the apparent daily variations in the number of eggs prior to the onset of clinical signs (21 May 2008).

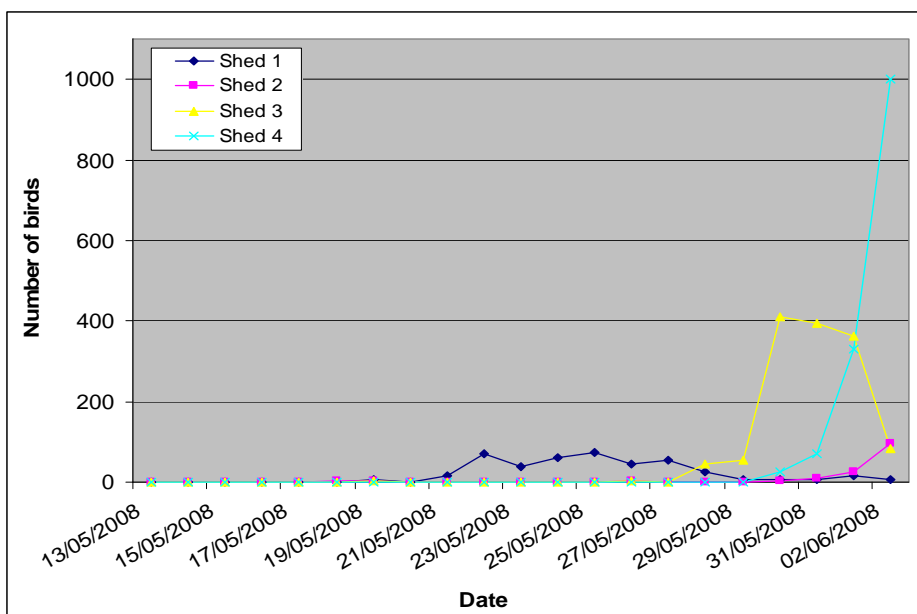


Fig 2: Daily mortality in Sheds 1 - 4 (13 May - 02 June 2008)

In combination the clinical findings, the mortality and egg production records and virology and serology results supported the hypothesis that a presumed Low Pathogenicity Avian Influenza (LPAI) virus of H7 subtype was introduced into the susceptible free-range layer population in Shed 1 on or around the second week of May 2008. Laboratory investigations provided support for this hypothesis. H7 viral RNA was detected from faecal samples collected from beneath Sheds 1 and 2. Further molecular analysis yielded, from one of these samples, an identical haemagglutinin (HA) cleavage site sequence to that of an unrelated H7 influenza virus identified in 1976. The

pathotype of this virus was determined by intravenous pathogenicity index (IVPI) testing, which clearly demonstrated the virus to be of low pathogenicity, with an IVPI of 0.0 (Paul Selleck, personal communication). Westbury and others (1979) further demonstrated the avirulent nature of the virus.

During the current outbreak, the introduction of the putative LPAI H7 virus resulted in the development of clinical disease first in Shed 1, evident on 21 May 2008. Table 2 summarises the clinical data for each house on the IP to the time of initial veterinary enquiry (02 June 2008).

| Shed | 1 | 2 | 3 | 4 |
|----------------------------|---------|--------|--------|--------|
| Number birds placed | 3,000 | 3,000 | 3,000 | 16,000 |
| Duration of clinical signs | 13 days | 5 days | 8 days | 4 days |
| Morbidity | 1% | 30% | 80% | 40% |
| Number died 02 June | 5 | 96 | 84 | 1,000 |
| Cumulative mortality | 426 | 145 | 1,364 | 1,429 |
| Mean daily mortality (%)* | 1.0% | 1.0% | 5.7% | 2.2% |
| Total mortality (%) | 14% | 5% | 45% | 9% |
| Egg drop (%)* | 37% | 11% | 36% | 26% |

Mean daily mortality (%)* calculated for duration of clinical signs in each shed.

Egg drop (%)**: Difference between mean of number of eggs collected daily for each shed over time period (days) after onset of clinical signs calculated, and divided by mean of number of eggs collected daily for same number of days prior to the onset of clinical signs.

Table 2: Summary clinical data for each house on the IP (to 02 June 2008).

Serological evidence further substantiated the spread of LPAI H7 infection to the other mobile houses, supported by clinical records. Overt clinical signs of disease were not apparent in Shed 3 until 26 May 2008. Furthermore, the rapid escalation in the severity of clinical disease in Shed 3, notably the daily mortality from 29 May 2008, was consistent with the mutation of the presumed LPAI H7 virus to high pathogenicity in the presence of a partially immune poultry population in that

house. The events leading to the eventual acquisition of the highly pathogenic genotype and phenotype occurred 7-10 days after the initial clinical presentation in Shed 1. Furthermore, following the acquisition of the HPAI genotype in Shed 3, approximately half of the birds died over a 5-day period, which suggests that this proportion of the poultry population were naïve and had not seroconverted to prior H7 LP infection at that time. Immediate spread (on or around 29 May) of the HPAI H7N7 virus then occurred from Shed 3 into a fully susceptible population in Shed 4 resulting in an acute and severe clinical deterioration.

Laboratory analyses further supported the onward spread of the HPAI H7N7 virus back into Shed 1 and Shed 2 at this time.

Whilst the definitive source of this outbreak remains undetermined, preliminary molecular analyses based on the HA gene of the HPAI H7N7 virus have shown that phylogenetically the virus clusters with known, contemporary poultry and wild bird H7 isolates from Europe (Defra, 2008b). Furthermore, whilst significant uncertainty exists regarding the true AI status of the mallard ducks present on the IP, a number of relevant factors existed. The presence of the pond would act as a potential attractant to other wildlife, including wild waterfowl. At the time of the outbreak wild bird activity around the IP was described as being low. Whilst the mallards were non-migratory introductions and resided at the pond, they would also be likely to travel and mix with other birds including waterfowl at other nearby bodies of water, abundant in the 3km Protection Zone surrounding the IP (Defra 2008b). In addition, Shed 1 was located in closer proximity to the pond for the first time, in a sheltered valley location. There had also been repeated observations of mallard ducks traversing the mobile house ranges and mingling with the layer hens. In combination these findings indicate that the mallard ducks presented a significant hazard and likely hypothetical route for the primary introduction of a LPAI H7 virus to the free-range poultry on the site, and it remains plausible that the mallard ducks became infected with the presumed LPAI H7 virus following contact with wild waterfowl. Furthermore, laboratory investigations also detected a point mutation in two separate HPAI H7N7 isolates from hens on the IP that is considered to be part of the host-adaptive process following transmission from waterfowl.

This most recent UK outbreak in common with the outbreak in November 2007 of HPAI H5N1 (Defra, 2007) highlights the

potent hazard of locating a free-range poultry production unit in close proximity to open water, both likely to attract wild birds and predispose to an increased likelihood of contact and risk of transmission of avian influenza viruses.

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Westbury, H.A., Turner, A.J. and Kovesdy, L. (1979). The pathogenicity of three Australian fowl plague viruses for chickens, turkeys and ducks. *Veterinary Microbiology*; 4, 223-234.

Imported birds in Quarantine: A total of 40 submissions comprising 120 samples were received during the quarter, of which 24 were chicken samples, 33 duck samples, 18 partridge samples, 44 pheasant samples and one raptor sample. No haemagglutinating viruses were detected.

Pigeons: Testing of samples from four submissions yielded Pigeon paramyxovirus type 1 (PPMV-1), following virus isolation in embryonated fowls' eggs.

Avian influenza (AI): In addition to serum samples received for statutory

testing as part of the HPAI H7N7 outbreak investigations, 13 submissions consisting of 2,267 chicken sera were tested for AI antibodies by AGP test. All samples were tested negative.

PPMV-1 serology: One submission comprising one pigeon serum sample was received and tested for PPMV type 1 antibodies with negative results.

Export serology: Four submissions consisting of 690 chicken sera were received for avian influenza ELISA testing. Seronegative results were recorded.

**Great Britain AI Wild Bird Surveillance (AIWBS) Results: April - June 2008
Avian Virology, VLA Luddington**

Avian influenza, including Highly Pathogenic Avian Influenza (HPAI) H5N1, was not detected from any of the wild birds sampled and tested during the last quarter (Table 3).

| Surveillance activity | Number of birds examined | Positive AI virus result and species of bird | Comments |
|---------------------------|--------------------------|--|--|
| Legally trapped (ringing) | Nil | - | Outside seasonal targeted surveillance period. |
| Legally shot | Nil | - | Outside seasonal targeted surveillance period. |
| Found dead* | 335 | Nil | Scanning surveillance, all-year-round. |

* Of the 'found dead' birds tested, pigeon paramyxovirus type 1 (PPMV-1) was isolated from a pigeon mortality incident in Scotland.

Table 3: Number of wild birds tested and results (April - June 2008).

Submissions to the EU Reference Laboratory for Newcastle Disease and AI, April to June 2008
VLA Weybridge

The table below lists the viruses received from EU countries during the second quarter of 2008, however they were not necessarily isolated during this time period. The figures in this table do not account for any detections of type A influenza viruses by Matrix gene RRT-PCR that did not yield haemagglutinating viruses after attempted virus isolation in embryonated fowls' eggs.

| Country | Host | Virus Type | IVPI/Lineage | H Cleavage Site Seq |
|----------|-------------------|----------------------|--------------|----------------------|
| Belgium* | Duck | H1N1 | LPAI | N/D |
| | Mallard | H3N8 | LPAI | N/D |
| | Common Shelduck | H4N6 | LPAI | N/D |
| | Turkey | H6N8 | LPAI | N/D |
| | Northern Pintail | H11N9 | LPAI | N/D |
| | Duck | H12N2 | LPAI | N/D |
| | Gull | H13N2 | LPAI | N/D |
| | Pigeon | PPMV-1 | N/D | RQKRF# |
| | Goshawk | PPMV-1 | N/D | N/D |
| Turkey | Chicken | H5N1 x 3 NDV x 26 | HPAI tbc | PQGERRRKKRGLF tbc |
| Romania | Domestic Cat | H5N1 | HPAI | PQGERRRKKRGLF |
| | Poultry | NDV x 3 | N/D/5d | RRQKRF |
| Denmark | Domestic Duck | H7N1 | LPAI | PEIPKGRGLF |
| Sweden | Farmed Mallard | H6N2 | 0.18 LPAI | N/D |
| UK | Pigeons/Doves | PPMV-1 x 11 | N/D | N/D |
| | Free range Layers | H7N7 | 3.00 HPAI | PEIPKRKKRGLF |
| | | | | |

Viruses not necessarily isolated within this time period.

N/D = not done.

* = all viruses isolated during 2007.

= test carried out in lab of origin.

tbc = to be confirmed.

FOOD SAFETY AND ZOOSES

VLA Winchester

FOOD SAFETY

Lead toxicity was confirmed in a flock of 2,000 free range layers. The hens were 42 weeks of age and had been in lay for 22 weeks. The flock had never reached its expected production potential. Post mortem examinations revealed egg peritonitis and lead shot was found in the gizzard of several birds, in one case amounting to 59.0 g of lead shot in the gizzard. The hens' range was next to a clay pigeon shoot and lead shot from the shoot was the source of lead. Analysis of 40 eggs revealed elevated concentrations of up to 2.55 ppm lead in the egg contents. The owner agreed to voluntarily withhold the eggs from sale and, because a time period could not be advised after which the eggs would become fit for human consumption, the decision was made by the owner to slaughter the flock. The Food Standards Agency (FSA) were informed as soon as the problem was identified. There are ongoing discussions between Trading Standards, FSA and the farmer as to how he can best clean up and continue to farm the existing contaminated land.

SALMONELLA REPORT

No clinical cases of *S. Enteritidis* have been recorded on VIDA in chickens during the quarter, or during the last three years.

Sampling of chicken layer flocks according to the requirements of the *Salmonella* National Control Programme (NCP) for layers is ongoing. More details on the *Salmonella* NCP in layers can be found on Defra's website <http://defraweb/animalh/diseases/zoonoses/ncp.htm>.

The annual incidents for *S. Enteritidis* and *S. Typhimurium* in turkeys are shown in the table below. An incident is defined as "the first isolation and all subsequent isolations of the same serovars or

serovars and phage/definitive type combination of a particular *Salmonella* from an animal, group of animals or their environment on a single premises, within a defined time period (usually 30 days)".

The annual incidents of *S. Enteritidis* and *S. Typhimurium* in turkeys are shown below:

| | 2004 | 2005 | 2006 | 2007 | 2008 (Q1 & Q2) |
|---------------------|------|------|------|------|----------------|
| Enteritidis (total) | 0 | 0 | 0 | 0 | 0 |
| Typhimurium (total) | 38 | 23 | 38 | 12 | 0 |

Note: The incidents of *S. Enteritidis* and *S. Typhimurium* exclude isolates arising from the 2006/07 EU survey of turkey flocks (see Quarterly Report, July-September 2006, appendix 1) or the previous EU layer and broiler surveys (Qu Rep July-Sept 2005 p4).

The annual incidents of *S. Binza* and *S. Orion* in pheasants are shown below.

| | 2004 | 2005 | 2006 | 2007 | 2008 (Q1 & Q2) |
|---------------|------|------|------|------|----------------|
| Binza (total) | 4 | 10 | 21 | 7 | 6 |
| Orion (total) | 1 | 3 | 3 | 2 | 2 |

SALMONELLA ZO4 VISITS

Nine *Salmonella* ZO4 visits were recorded during the quarter, all in chickens. Seven related to *S. Enteritidis* in layers, one to *S. Typhimurium* in broilers and one to *S. Virchow* in broilers.

ENDEMIC/NEW AND EMERGING DISEASE SURVEILLANCE

VIROLOGY REPORT VLA Weybridge

Virus Isolation and Identification:

A total of 92 samples from 60 submissions were received during the quarter for attempted virus isolation and/or electron microscopy (EM) examination from a variety of commercial and backyard poultry, game birds and from captive birds.

Chickens: An Infectious Bronchitis virus (IBV), which showed an antigenic relationship to the QX strain in one-way HI serology, was isolated from the intestinal content of a Light Sussex chicken aged 7-weeks. In total, 12 chickens had been lost, the majority as 'sudden deaths', but some were seen to be 'sick', from a small flock of 40 unvaccinated birds (27 Light Sussex and 13 Rhode Island Red) in Yorkshire. The birds had been placed as day-olds and were being reared for meat. Five affected birds were subject to post-mortem examination (PME), with four having been submitted over a 48-hour period to the VLA for investigation. All four of these birds were in poor body condition with pasty, soft faeces. In one of the birds the main gross finding was pallor and enlargement of the kidneys, and in a second bird multi-focal, linear duodenal mucosa haemorrhages up to 15mm in size were seen. The IBV QX variant strain was first identified in the United Kingdom (UK) following investigation during August 2008 of the loss of a recently purchased 6-8 week old Pekin bantam in a small backyard flock in South East England (Gough and others, 2008). In that case the involvement of a nephropathogenic strain of IBV was suspected following PME – pale and enlarged kidneys with markedly distended ureters with white urate content were seen grossly. Since the IBV QX strain was first identified in China in the late-1990s from IBV-vaccinated flocks (Yu and others, 2001), there has been an apparent westward spread of this IBV variant. Detections of the 'European' QX-type IBV have been made since 2002 (Beato and others, 2006; Worthington and Jones, 2006). Interestingly the first detection in Italy was also from a backyard flock approximately six weeks of age in which high mortality and nephritis were reported (Beato and others, 2006), similar to the UK cases. Nephritis appears to be a typical pathological finding in chickens infected with IBV QX, often with elevated mortality. Egg production problems have been reported in layers (Liu and others, 2006; Beato and others, 2006) and

proventriculitis in affected broiler flocks in China (Yu and others, 2001). This is the second isolation of IBV QX in the UK from backyard chickens in the past 10-months as a result of VLA scanning surveillance activities for endemic and new and emerging diseases. These episodes also clearly highlight the presence of this IBV variant within the UK poultry population. However, the extent of virus circulation is currently unquantified; hence the potential threat that this novel IBV variant may pose to the commercial poultry sector is also unknown.

In total during the quarter, 36 samples were received from chickens. Reoviruses were isolated on three occasions from broilers. Two of the submissions were from birds aged between 14-days and 16-days. No descriptive or clinical information was provided with one of the chicken submissions from which reoviruses were isolated.

Game birds: From a total of 20 intestinal samples submitted (pheasants 14; partridges 5; guinea fowl 1), rotavirus was identified by EM on eleven occasions. Ten of these rotavirus-positive samples were from pheasants aged between 6 – 13 days, with the remaining positive sample derived from 14-day-old partridges. A reovirus was isolated from 16-day-old partridges.

Turkeys: Rotavirus was identified by EM examination of intestinal contents from 13-day-old turkey poults. A further ten separate enteric turkey poult samples were examined by EM, with negative results.

Ducks and geese: Duck Virus Enteritis (DVE) was identified on one occasion. DVE remains a seasonal disease of waterfowl, with episodes most commonly occurring during the Spring through to June.

Various: A reovirus was isolated from captive scrubjays where 18 out of 40 scrubjays, two Eurasian jays and one jackdaw died over an 8-day period after the birds were put in outside aviaries. Scrubjay losses were reported to have occurred in two different age groups of the birds, which

had been imported from the USA in the last year. Histopathology examination of liver from the carcase of a second scrubjay casualty revealed a random multifocal acute necrotic hepatitis, suggestive of a particulate infectious aetiology. Whilst it is frequently difficult to ascribe clinical significance to the isolation of reoviruses in birds due to their ubiquity, high mortality has been reported in budgerigars associated with infection with a reovirus-like agent (Manvell and others, 2004).

Serology

Infectious bronchitis (IB): 11 submissions consisting of 33 chicken sera were tested for IB virus haemagglutination inhibition (HI) antibody testing using a panel of IBV antigens.

Infectious laryngotracheitis (ILT): Seven submissions of 36 chicken serum samples were received, of which three submissions had antibody titres. In two of the submissions the birds were 4-weeks-old with one from a 15-month-old chicken.

Avian encephalomyelitis virus (AEV): One submission of three pheasant sera was received; two of the samples were seropositive.

Avian paramyxovirus (APMV): Three submissions of raptor sera, totalling 12 samples were received and tested for avian paramyxovirus (AMPV) serology. All samples were negative.

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OTHER AVIAN TOPICS VLA Winchester

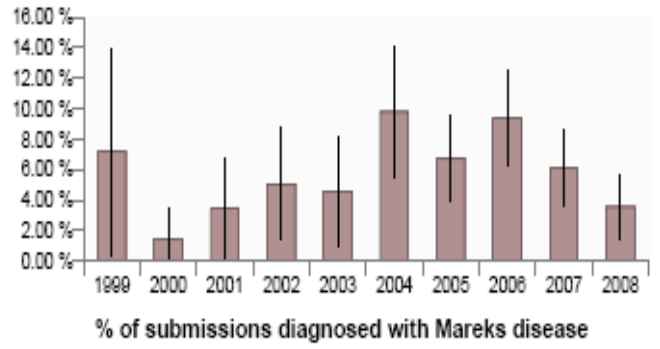
BLACKHEAD UPDATE

No incidents of blackhead (histomonosis) were reported in turkeys during the quarter. A single diagnosis was recorded in chickens.

MAREK'S DISEASE UPDATE

There was a decline in the number of Marek's disease diagnoses compared with the same quarter of last year (Fig 3).

Fig 3: VIDA incidents of Marek's disease in chickens (as a percentage of diagnosable submissions) April – June 1999-2008



(Vertical bars represent 95% confidence limits)

VLA BURY ST EDMUNDS
Avian histopathology submissions
for the six month period January-June 2008

| | | |
|--|-----------|-------------|
| No. of cases received: January – March | Cases: 83 | Blocks: 378 |
| April – June | Cases: 98 | Blocks: 342 |

Total number of cases received: Cases: 181 Blocks: 720

| Category of bird | No. of cases |
|------------------|--------------|
| Domestic fowl | 93 |
| Turkeys | 1 |
| Pheasants | 7 |
| Partridges | 3 |
| Ducks | 11 |
| Geese | 5 |
| Miscellaneous | 32 |
| Wild birds | 29 |

Domestic fowl

Eight cases of Marek's disease were diagnosed with a further six cases of lymphoma (most likely Marek's disease, but hampered by autolysis and one histiocytic form). ILT was diagnosed on three occasions and avian tuberculosis once. Neoplastic lesions consisted of adenocarcinoma in six cases – one of which was likely oviductal in origin and another likely pancreatic. An ovarian arrhenoblastoma was diagnosed in one hen with one case of erythroblastoma and one of a mixed myelocytoma/blastoma. Lesions consistent with circulatory failure were seen in two broiler submissions with a further two presenting as broiler ascites. One case of blackhead was diagnosed (in conjunction with Marek's disease). Ulcerative dermatitis/cellulitis was seen in laying chickens and appeared to be associated with *E.coli* serotype O2. Listeriosis was suspected when Gram positive bacteria were demonstrated in association with an encephalitis in a 6-month-old hen. Infectious avian encephalomyelitis presented with neuronal chromatolysis and encephalitis in 2- to 3-week-old chicks.

Gamebirds

A severe heterophilic nephritis was thought to be associated with coronavirus infection in pheasants. The same bird had an ulcerative oesophagitis in the presence of numerous *Capillaria* sp. worms in the mucosa.

Ducks

Duck Virus Enteritis was diagnosed on six occasions with one other suspicious case.

Miscellaneous

Arteriosclerosis was diagnosed in a parrot. A severe septic peritonitis/perihepatitis and hepatitis in a starling was thought to be related to intestinal perforation by endoparasites seen within the intestinal tract. Amyloidosis was detected in a rhea.

Wild birds

Pulmonary aspergillosis was seen in a Mute swan and a Whooper swan the latter also having lesions of an encephalitis. An encephalitis of unidentified cause was also seen in a Mute swan. Avian tuberculosis was diagnosed twice in swans. One swan had renal, hepatic and pancreatic amyloidosis and amyloidosis was detected in the spleen of another swan. A Group B salmonella was thought to be the cause of oesophagitis and necrotic hepatitis in a greenfinch. A bacterial pneumonia with multifocal necrotic hepatitis was seen in a rook (likely due to pasteurellosis).