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APHA parasitology group

Annual review of literature and horizon scanning report 2020

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APHA is an Executive Agency of the Department for Environment, Food and Rural Affairs and also works on behalf of the Scottish Government, Welsh Government and Food Standards Agency to safeguard animal and plant health for the benefit of people, the environment and the economy.

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Ruminant and porcine parasitic diseases surveillance in GB in 2020

Sheep

According to the Veterinary Investigation and Diagnosis Analysis (VIDA) databases, parasitic gastroenteritis (PGE) was the most common disease diagnosed in sheep in 2020 in GB. A total of 516 diagnosis of PGE were made in 2020. This number includes the diagnosis of haemonchosis (82) and nematodirosis (37). Diarrhoea, wasting and death were the main clinical signs associated with the diagnosis of PGE. PGE was constantly detected throughout the year, with a peak during the third quarter. The majority of the diagnoses were recorded in post-weaned lambs. However, 51% of diagnoses of Haemonchus contortus were in adult animals, confirming that all ages of sheep can be affected by this blood sucking worm. Historically, haemonchosis was considered only to be a problem in the South East of England, but now, as shown in figure 1, the geographic distribution of this parasite has changed and the disease is now diagnosed in all of GB.

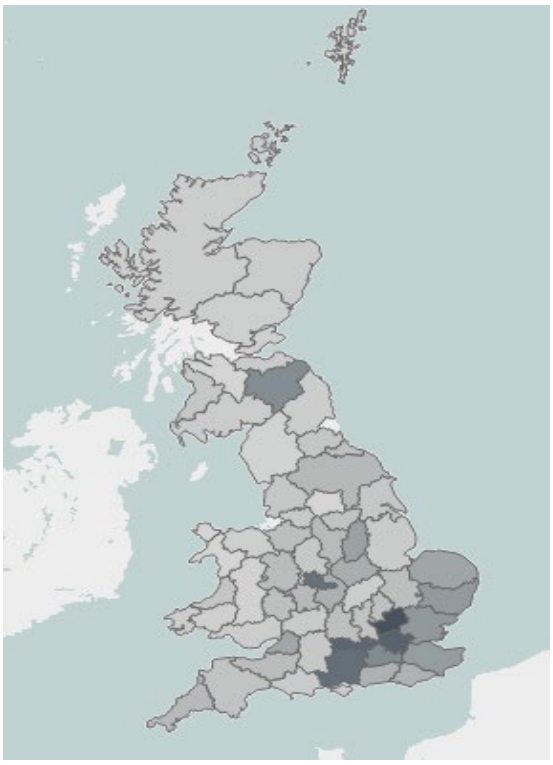

Figure 1: Counties in Great Britain where Haemonchus contortus was identified through VIDA diagnoses. Shadings on the map represent the number of submissions divided by the number of holdings for selected species (sheep) and per specific county.

VIDA contains a record of every diagnostic submission from livestock and wildlife in Great Britain made to the Veterinary Investigation Centres of the Animal and Plant Health Agency (APHA), its partner PME providers and to Scotland's Rural College Veterinary Services (SRUC VS). It has been operating since 1975. Submissions recorded on VIDA represent only submission of clinical diagnostic material, hence this represents a source of bias.

In 2020 ovine toxoplasmosis remained the second most common cause of ovine abortion, just behind chlamydial (enzootic) abortion. Therefore, given the clinical and economic significance of Toxoplasma gondii infection in sheep, APHA is collaborating with the University of Milan to identify by phylogenetic analysis the T. gondii strains causing ovine abortion in GB.

Cattle

According to the VIDA database, coccidiosis was the most common parasitic disease diagnosed in cattle in 2020. The pathogenic Eimeria species, Eimeria bovis and Eimeria zuernii, are the two species that cause the most pronounced disease in calves less than one year of age. Clinical signs are more common in young calves reared under intensive husbandry conditions.

Eimeria alabamensis can also causes disease at extremely large infective doses (>10 million oocysts) only. Coccidiosis caused by this pathogen is particularly observed in pastured calves within two weeks after spring turnout for their first grazing season. Clinical outbreaks of E. alabamensis have been reported in the UK.

An interesting review article focused on ruminant coccidiosis has been recently published in 2020 by Bangoura (1).

Pigs

According to the VIDA database, porcine coccidiosis was the most common parasitic diseases diagnosed in pigs in 2020.

Suckling piglets from around seven days of age were the main age group in which coccidiosis was diagnosed, as expected as Cystoisospora suis is a pathogen of preweaned piglets. Affected pigs frequently show pasty to watery non-haemorrhagic

diarrhoea and, if not treated, marked weight loss can follow. Morbidity can approach 100% of piglets within a litter, while mortality is usually low unless other pathogens or environmental challenges are involved.

Clinical coccidiosis involving Eimeria species is uncommon in post-weaned pigs. Diagnoses in post-weaned pigs at APHA in the last decade have involved similar epidemiological scenarios with disease occurring in young replacement breeding gilts or boars born and reared indoors, then moved at around six to seven months old. In these incidents, disease usually occurred within two weeks of moving and it is assumed that they were exposed after moving to ground contaminated with coccidial oocysts; cases are sometimes concurrent with salmonellosis and clinical signs included diarrhoea, wasting and deaths.

Diagnosis of C. suis is not easy in prepatent cases, before oocysts are excreted in faeces; and patent cases may also have variations in the length and intensity of excretion, adding to the challenge of confirming infection in faecal samples. The submission of live typically affected pigs early in the course of disease from several litters for post-mortem and histopathological examination greatly enhances the ability to diagnose coccidiosis in preweaned piglets. Because it is possible to have combined infection with other enteric pathogens (such as Clostridium perfringens, rotavirus, enteric colibacillosis), laboratory investigation for differential diagnoses is recommended.

Where toltrazuril is used to prevent diarrhoea and wasting due to coccidiosis in young piglets, the aim is to apply treatment at an early stage of the parasite’s life cycle before clinical disease occurs, to arrest the developing stages while still exposing the piglets to allow them to mount an effective immune response. Correct timing of treatment according to veterinary advice is particularly important for successful control.

Recently, a toltrazuril-resistant strain of C. suis was described in the Netherlands but does not yet appear to be very common (2). In 2020, another paper highlighted the difficulties of controlling C. suis infections in Europe (3). Apparent treatment failure does not necessarily equate with the presence of resistance and investigation may reveal other causes, for example, treating at the wrong time, underdosing or disease being caused by something other than coccidiosis.

Horizon scanning for new and emerging veterinary parasitological threats relevant for GB

Small animals

Since the introduction of the Pet Travel Scheme (PETS), pet travel to and from Europe has increased, alongside the exchange of pets between countries. The commercial imports of dogs entering the UK from Romania had increased in 2020 by 60% compared to 2019 imports, with 32,525 dogs brought into the country by commercial means. Significant increases in imported dog numbers were also recorded from Hungary, Poland, Bosnia and Herzegovina, Russia and Greece (4). As a consequence, zoonotic parasitic diseases not previously commonly seen in the UK, such as dirofilariasis, thelaziosis, leishmaniosis and linguatuliasis, are increasingly diagnosed in UK veterinary practice in travelled or imported dogs (5) (6).

There are currently multiple sources of best practice guidance for the prevention, diagnosis and control of these exotic parasites recommended by different stakeholder groups:

- European Society of Dirofilariosis and Angiostrongylosis http://www.esda.vet/index.php/guidelines
- European Scientific Counsel Companion Animal Parasites https://www.esccap.org/travelling-pets-advice/
- http://apha.defra.gov.uk/documents/surveillance/diseases/thelazia-callipaeda.pdf

Exotic parasites should be considered as possible infections in imported pets. Vets and nurses are in the front line of UK biosecurity and must be prepared to give accurate travel advice to clients.

Besnoitia in livestock

In 2010, the European Food Safety Authority (EFSA) wrote a paper, where it identified besnoitiosis as an emerging threat in Europe. This followed the 2009 World Association for the Advancement of Veterinary Parasitology Conference, where besnoitiosis had also

been identified as an emerging disease. In Europe, bovine besnoitiosis appeared to initially be restricted to endemic foci in the Pyrenees (Southern France) and Alentejo region (Portugal). During the last decade, a significant geographical expansion occurred towards other parts of Europe, including Belgium, Croatia, Germany, Greece, Hungary, Ireland, Italy, Spain and Switzerland.

The EFSA paper highlighted the need for detailed surveillance of the disease, improved diagnostic tools and greater knowledge regarding routes of transmission and risk factors associated with disease.

Following this, a seroprevalence study of animals imported from mainland Europe in GB was carried out by APHA using surplus serum samples from animals eligible for bluetongue post-import testing during March to May 2018. Samples from 221 animals originating from Austria, France, the Netherlands, Sweden and Switzerland were tested using the ID.vet ELISA. All samples tested negative and the report of this study was published in 2020: http://apha.defra.gov.uk/documents/surveillance/diseases/besnoitia-feb-2020.pdf.

With the current trend for many GB dairy farms to source replacement heifers from continental Europe, as well as the trade in pedigree stock, it is important to remain alert to the possibility of introduction of B. besnoiti via asymptomatic imported cattle. Besnoitiosis is not currently notifiable by law, but it would be unfavourable for it to become established in the UK cattle population as it is incurable and has serious consequences for animal welfare and production. An antibody ELISA test is available at APHA and private veterinary surgeons are recommended to consider testing any suspicious cases to aid in scanning surveillance for this potential emerging disease.

Anthelmintic resistance

Suspected lack of anthelmintic efficacy is regularly report by APHA to the Veterinary Medicines Directorate (VMD) under the Suspected Adverse Reaction Surveillance Scheme.

If you find that an anthelmintic is not working as well as it should, this is known as a 'Suspected Lack of Efficacy' situation and you should:

- report the event to the VMD's Suspected Adverse Reaction Surveillance Scheme (SARSS) team using a 'yellow' form (MLA252A) or online via the VMD website: https://www.vmd.defra.gov.uk/adversereactionreporting/report-type
- arrange investigations to determine if this is a resistance problem or a different cause of the lack of efficacy – the manufacturer of the anthelmintic used may be able to help with this investigation

Anthelmintic resistance in ruminants

Anthelmintic resistance has been identified in worm populations in UK ruminants for decades and there are increasing trends for the presence of resistance to many of the commonly used anthelmintics.

Detection and investigation of anthelmintic resistance is an important part of APHA's surveillance activities, and APHA together with the Moredun Research Institute reported the first confirmed case of benzimidazole resistant in Ostertagia ostertagi in the UK in cattle. This investigation was published in the Veterinary Parasitology Journal (7).

Useful information regarding the sustainable control of parasites in ruminants are available from the website of these organisations:

- Sustainable Control of Parasites (SCOPS) https://www.scops.org.uk/
- Control of Worms Sustainably (COWS) groups https://www.cattleparasites.org.uk/

Anthelmintic resistance in poultry

Ascaridia galli and Ascaridia dissimilis are nematodes of the Ascarididae family and are two of the most common and economically important nematode parasites of chickens and turkeys, respectively, with up to 100% of birds in some flocks infected. Helminth control is

typically achieved via the frequent administration of anthelmintic drugs, with fenbendazole (FBZ). Researchers have recently definitively demonstrated resistance to FBZ in A. dissimilis in turkeys in USA (8).

APHA is offering faecal egg count reduction tests to practitioners in order to investigate this potential new emerging threat.

Anthelmintic resistance in horses

Anthelmintic resistance in equine cyathostomins is widespread and highly prevalent in the benzimidazole and tetrahydropyrimidine classes; and reports of lack of efficacy to macrocyclic lactone (ML) drugs have also been recently suspected on clinical grounds. In 2020, ML resistance in cyathostomins was clearly demonstrated for the first time in horses imported to the United States from Ireland (9). The global movement of horses has the potential to spread ML-resistant parasite isolates around the world, and in 2021 the first confirmed case of both Ivermectin and Moxidectin resistance in equine cyathostomins in the UK was documented (10). The equine industry is strongly encouraged to routinely monitor anthelmintic efficacy, so occurrence of ML resistant cyathostomins can be detected and appropriate interventions implemented as early as possible.

List of scientific papers published in peer review journals by the APHA Parasitology team in 2020

Macrelli M; Brena C; Reichel R; Boufana B; Mitchell ES 2020

16 July 2020

Bovine cysticercosis outbreak in an indoor beef finisher farm in the North of England.
Veterinary Record Case Reports 8 (3) e001178.
https://dx.doi.org/10.1136/vetreccr-2020-001178
Impact factor: 0.12 Not applicable.

Macrelli M; Phipps P; McGinley L; Medlock J; Johnson N 2020
13 November 2020
First report of fatal tick pyaemia caused by heavy infestation with the red sheep tick, Haemaphysalis punctata and co-infection with Babesia and Theileria species.
Veterinary Record Case Reports 8: e001267.
https://dx.doi.org/10.1136/vetreccr-2020-001267
Impact factor: 0.12 Not applicable. ED1100 Collaborators: Public Health England, Port Down, Salisbury, UK.

Melville LA; Redman E; Morrison AA; Chen PCR; Avramenko R; Mitchell S; Van Dijk J; Innocent G; Sargison F; Aitken C; Gilleard JS; Bartley DJ 2020
8 October 2020
Large scale screening for benzimidazole resistance mutations in Nematodirus battus, using both pyrosequence genotyping and deep amplicon sequencing, indicates the early emergence of resistance on UK sheep farms.
International Journal for Parasitology: Drugs and Drug Resistance 12, 68–76.
https://doi.org/10.1016/j.ijpddr.2020.03.001
Impact factor: 3.009 Not applicable. Collaborators: Department of Disease Control, Moredun Research Institute, Pentlands Science Park, Bush Loan, EH26 0PZ, UK. Department of Comparative Biology and Experimental Medicine, Faculty of Veterinary Medicine, University of Calgary, Calgary, Alberta, Canada. Centre for Preventive Medicine, Animal Health Trust, Lanwades Park, Kentford, Newmarket, Suffolk, CB8 7UU, UK. Zoetis, Birchwood Building, Springfield Drive, Leatherhead, KT22 7LP, UK. Biomathmatics and Statistics Scotland, JCMB, King's Buildings, Peter Guthrie Tait Road, Edinburgh, EH9 3FD, UK Open access.

Melville LA; Van Dijk J; Mitchell S; Innocent G; Bartley DJ 2020
8 October 2020
Variation in hatching responses of Nematodirus battus eggs to temperature experiences.
Parasites and Vectors 13, Article number: 494.
https://doi.org/10.1186/s13071-020-04368-9

Impact factor: 3.169 Not applicable. Collaborators: Disease Control, Moredun Research Institute, Pentlands Science Park, Bush Loan, Penicuik EH26 0PZ, UK. Zoetis, Birchwood Building, Springfield Drive, Leatherhead KT22 7LP, UK. Biomathematics and Statistics Scotland, JCMB, King's Buildings, Peter Guthrie Tait Road, Edinburgh EH9 3FD, UK. Open access.

Vuitton DA; McManus DP; Rogan MT; Romig T; Gottstein B; Naidich A; Tuxun T; Wen H; Menezes da Silva A; The World Association of Echinococcisis 2020
9 October 2020
Analysis of wild boar-domestic pig interface in Europe: preliminary analysis.
Parasite 27, 41.
https://doi.org/10.1051/parasite/2020024
Impact factor: 2.545 Not applicable. Collaborators: National French Reference Centre for Echinococcosis, University Bourgogne Franche-Comté and University Hospital, FR-25030 Besançon, France. Molecular Parasitology Laboratory, Infectious Diseases Division, QIMR Berghofer Medical Research Institute, AU-4006 Brisbane, Queensland, Australia. Department of Biology and School of Environment and Life Sciences, University of Salford, GB-M5 4WT Manchester, United Kingdom. Department of Parasitology, Hohenheim University, DE-70599 Stuttgart, Germany. Institute of Parasitology, School of Medicine and Veterinary Medicine, University of Bern, CH-3012 Bern, Switzerland. Department of Parasitology, National Institute of Infectious Diseases, ANLIS "Dr. Carlos G. Malbrán", AR-1281 Buenos Aires, Argentina. WHO Collaborating Centre for Prevention and Care Management of Echinococcosis and State Key Laboratory of Pathogenesis, Prevention and Treatment of High Incidence Diseases in Central Asia, CN-830011 Urumqi, PR China. Open access. The World Association of Echinococcosis: APHA authors.

Sgroi G; Varcasia A; D'Alessio N; Varuzza P; Buono F; Amoroso MG; Boufana B; Otranto D; Fioretti A; Veneziano V 2020
10 December 2020
Taenia hydatigena cysticercosis in wild boar (Sus scrofa) from southern Italy: an epidemiological and molecular survey.
Parasitology 147 (14) 1636–1642.
https://doi.org/10.1017/S0031182020001559

Impact factor: 2.783. Collaborators: Department of Veterinary Medicine and Animal Productions, University of Naples Federico II, Naples, Italy. Department of Veterinary Medicine, University of Bari Aldo Moro, Valenzano, Italy. Department of Veterinary Medicine, University of Sassari, Sassari, Italy. Istituto Zooprofilattico Sperimentale del Mezzogiorno, Portici, Italy. Osservatorio Faunistico Venatorio – Regione Campania, Napoli, Italy. Faculty of Veterinary Sciences, Bu-Ali Sina University, Hamedan, Iran. Open access.

Phipps P; Johnson N; Macrelli M; McGinley L; Hansford K; Medlock J 2020 26 June 2020
Expansion of red sheep tick range in England (letter).
Veterinary Record 186 (19) 651–652.
http://dx.doi.org/10.1136/vr.m2496
Impact factor: 2.101 Not applicable. Collaborators: Cliffe Veterinary Group, Radstock House, Lewes, East Sussex BN7 2AH. PHE, Porton Down, Salisbury, Wiltshire SP4 0JG.

Johnson N; Phipps LP; McFadzean H; Barlow AM 2020
06 July 2020
An outbreak of bovine babesiosis in February, 2019, triggered by above average winter temperatures in southern England and co-infection with Babesia divergens and Anaplasma phagocytophilum.
Parasites & Vectors 13 Article number: 305.
https://doi.org/10.1186/s13071-020-04174-3
Impact factor: 3.342 Not applicable. SV3045; ED1036 Collaborators: Wildlife Network for Disease Surveillance, School of Veterinary Science, University of Bristol, Langford, Somerset, BS40 5DU, UK. Open Access.

Johnson N; Phipps P; Godbole G; Hansford K; Johnston C; White M; Medlock J 2020
17 September 2020
Preventing tick exposure in vets and farmers (letter).
Veterinary Record 187 (5) 195.
http://dx.doi.org/10.1136/vr.m3334
Impact factor: 2.101 Not applicable. Collaborators: Consultant parasitologist National Infection Service, PHE, 61 Colindale Avenue, Colindale, London, NW9 5EQ. PHE, Porton Down, Salisbury, Wiltshire, SP4 0JG.

List of surveillance reports published on the APHA website by the APHA Parasitology team in 2020

- Be alert to Haemonchus contortus – July 2020
- Sheep scab – resistance English | Welsh – July 2020
- Taenia saginata - Transmission of tapeworms between humans and cattle – July 2020 – English | Welsh
- Increase in tick numbers and tick-borne diseases reported, particularly in sheep – May 2020
- Seroprevalence survey for Besnoitia besnoiti in cattle and buffalo imported to mainland UK from Europe in 2018 – February 2020

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2. Shrestha A, Freudenschuss B, Jansen R, Hinney B, Ruttkowski B, Joachim A. Experimentally confirmed toltrazuril resistance in a field isolate of Cystoisospora suis. Parasit Vectors. 2017;10(1):317

3. Hinney B, Cvjetković V, Espigares D, Vanhara J, Waehner C, Ruttkowski B and others. Cystoisospora suis Control in Europe Is Not Always Effective. Frontiers in Veterinary Science. 2020;7(113)

4. Human Animal Infection and Risk Surveillance Group. Risk review and statement on the risk Brucella canis presents to the UK human population. Public Health England; 2021 February 2021

5. Mitchell S, Bell S, Wright I, Wall R, Jeckel S, Blake D and others. Tongue worm (Linguatula species) in stray dogs imported into the UK. Veterinary Record. 2016;179(10):259–60

6. European Scientific Council Companion Animal Parasite Ireland & UK. Parasite Forecast. 2017;01(January–March)

7. Bartley DJ, Jewell NJ, Andrews LM, Mitchell S, Morrison AA. Molecular and phenotypic characterisation of fenbendazole resistance in a field-derived isolate of Ostertagia ostertagi. Veterinary Parasitology. 2021;289:109319

8. Collins JB, Jordan B, Baldwin L, Hebron C, Paras K, Vidyashankar AN and others. Resistance to fenbendazole in Ascaridia dissimilis, an important nematode parasite of turkeys. Poultry Science. 2019;98(11):5412–5

9. Nielsen MK, Banahan M, Kaplan RM. Importation of macrocyclic lactone resistant cyathostomins on a US thoroughbred farm. Int J Parasitol Drugs Drug Resist. 2020;14:99–104

10. Bull K, Allen, K, Hodgkinson, J and Peachey, L. First confirmed case of both Ivermectin and Moxidectin resistance in equine cyathostomins in the UK. British Association for Veterinary Parasitology – Winter Meeting; 2–3 December; on line 2021

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