APRIL 2014
VOLUME 5 PART 1









Advances in Animal Biosciences

Science into Practice: planning for intensification

Proceedings of the British Society of Animal Science and the Association of Veterinary Teaching and Research Work includes BSAS/EBLEX Workshop Improving Ewe Efficiency Through Better Feeding





Advances in Animal Biosciences

Management Board

Nigel Scollan (Chair), Richard Dewhurst (BSAS), Mike Steele (BSAS), Howard Simmins (BSAS), Andrea Rosati (EAAP), Eberhard von Borell (EAAP), Philippe Chemineau (EAAP), Nicolas Friggens (INRA), Stephane Ingrand (INRA), Jaap Van Milgen (INRA)

Editor-in-Chief

Cledwyn Thomas, European Federation of Animal Science (EAAP)

Aims and Scope

Advances in Animal Biosciences is an associated publication to the journal animal. It aims to publish high-quality conference, symposium and workshop proceedings about animal-related aspects of the life sciences with emphasis on farmed and other managed animals. These can be in the form of a book of abstracts, summaries or complete papers. The format will highlight the title of the meeting and organisations involved but the publications will have the added advantage of forming a series under Advances in Animal Biosciences.

Subject areas can include aspects of Breeding and Genetics, Nutrition, Physiology and Functional Biology of Systems, Behaviour, Health and Welfare, Livestock Farming Systems, Human Health and Product Quality.

However, due to the integrative nature of biological systems, monographs and conference proceedings dealing with the translation of basic and strategic science into the whole animal and farming system and the impact on Productivity, Product Quality, Food Security, the Environment, Climate Change and Humans will be particularly welcome.

Information for Conference Organisers

The Animal Consortium together with Cambridge University Press offers conference organisers a package that enables publication of high-quality conference, symposium and workshop proceedings about animal-related aspects of the life sciences with emphasis on farmed and other managed animals.

Summaries, abstracts or full papers may be published in *Advances in Animal Biosciences* and high-quality invited papers from these meetings may be submitted and published as a defined series in *animal*.

Conference organizers interested in publishing their proceedings should send a proposal for publication in *Advances in Animal Biosciences*, *animal*, or both journals to astleger-honeybone@cambridge.org with the following information:

- Title and date of conference
- Contact person/guest editor
- Number of summaries/abstracts/full papers
- Total number of pages (estimated)
- Any colour printing requirements
- Number of hard copies or USBs required and form of distribution
- Target date for publication

A decision in principle will be made regarding the suitability for publication on the basis of your proposal, and the Special Issues Editor will provide a quote and agree any specific requirements or deadlines. Manuscripts submitted to *Advances in Animal Biosciences* will be reviewed by the Editor-in-Chief and papers submitted to *animal* will be peer reviewed. If accepted after review, proceedings will be published within 12 weeks of receipt by the Publisher.

SUMMARY LIST

NOVEL FEED INGREDIENTS

Alternative feed ingredients - Overview from an end-users perspective with specific reference to bioethanol co-products

PEV Williams

2 Insect protein for animal feed?

A Charlton, E Fitches

Evaluation of novel feed ingredients for aquaculture to meet fish production, health and sustainability in the 21st Century

S J Davies

EMERGING AND RE-EMERGING DISEASES

Emerging and re-emerging diseases of livestock in Europe M Beer

5 Emerging and re-emerging arboviral diseases in Europe: The emergence and control of Bluetongue in Northern Europe

P Mertens

- Modelling climate-driven changes in the seasonality of *Fasciola hepatica* D Smith, H Rose, E Morgan, D Williams, J van Dijk
- 7 Comparative proteome analysis of nasal secretion from healthy, malignant catarrhal fever (MCF) challenged and vaccinated cattle

MF Ghazali, NN Jonsson, GC Russell, RJ Burchmore, PD Eckersall

8 Retrospective profiling of the 2012 Schmallenberg virus incursion into Ireland R G ONeill, C Boland, P Ross

FEED EFFICIENCY

- 9 Improving feed efficiency in dairy production systems challenges and possibilities E E Connor
- Improvement of feed efficiency in pigs and poultry: current knowledge and future challenges H Gilbert
- Improving Feed Efficiency of Beef Cattle: Current state of the art and future challenges D A Kenny, C Fitzsimons, S M Waters, J Hyslop, M McGee

IMPROVING EWE EFFICIENCY THROUGH BETTER FEEDING

- Ewe nutrtion the known 'unkowns' LA Stubbings
- Maximising winter grass utilisation on sheep farms: all grass wintering P Frater, L Genever, J Vipond, R Jones
- Maximising forage and grassland utilisation through outwintering in-lamb ewes on swedes M Jones
- The effect of duration of removal from grazing on body weight in sheep measured with an automated weighing system

H Wishart, N Lambe, C Morgan-Davies, A Waterhouse

16	Automatic classification of foraging behaviour in sheep using Radio Frequency ID, movement sensor and video technology A Mason, J C Sneddon
17	Home-grown alternatives for by-pass soya bean meal J G M Houdijk, J E Vipond
18	Effect of forage type and level and source of DUP supply on ewe and lamb performance R G Wilkinson, N Naylor, A M Mackenzie, S E Pattinson, J Donaldson
19	The influence of ewe nutrition pre and post lambing on the incidence of mastitis K A Phillips, K P A Wheeler
20	Effect of oral biotin supplementation on white line lesions in a lowland sheep flock K P A Wheeler, C J Phythian, K A Phillips
21	To refine and confirm the level of selenium and iodine supplementation for breeding ewes K A Phillips, K P A Wheeler, H E Fuller
22	Effect of genotype and weight at mating on performance of ewes joined to lamb at 1 year of age T W J Keady, J P Hanrahan
SHEEP 23	BREEDING AND NUTRITION First-cross ewes from Scottish Blackface dams: an evaluation of progeny sired by three lowland breeds J P Hanrahan, T W J Keady
24	Effects of forage and breed types on the efficiency of utilisation of energy in hill replacement ewes Y G Zhao, R Annett, A Aubry, N E O'Connell, T Yan
25	Effects of breed and forage types on methane emission factors for lowland replacement ewes aged between 8 and 19 months A Aubry, R Annett, T Yan
26	Effect of starting date and length of lambing season on dairy sheep profitability in Greece - a simulation study G E Valergakis, S-A Termatzidou, S P Kechagia, P Kazana, Z Basdagianni
27	The effect of weaning system on the milk fatty acid profile of Chios sheep breed O Tzamaloukas, M Orford, D Miltiadou, C Papachristoforou
28	Effects of forage and breed types on the efficiency of utilisation of nitrogen in hill replacement ewes Y G Zhao, R Annett, A Aubry, N E O'Connell, T Yan
29	Effects of breed and forage types on methane emission factors for hill replacement ewes aged between 9 and 18 months A Aubry, R Annett, T Yan, A Uprichard
30	Benefit of by-pass based protein supplementation on periparturient ewe performance J G M Houdijk
31	The effect of iron supplementation on hepatic copper content of growing lambs S M Sefdeen, A M Mackenzie, R G Wilkinson

PATHOLOGY AND FARM ANIMALS

- Pathogenesis of Pestivirus infections J Brownlie
- The epithelial-endothelial barrier in influenza virus pathogenesis K Short, J Kasper, C Kirkpatrick, E Veldhuis Kroeze, R Fouchier, T Kuiken

- Host response to footrot in sheep G Maboni, M Bexon, R Davenport, C Heawood, M Baker, K Baiker, L Green, S Tötemeyer
- Investigating the bovine caruncular epithelial cell line as a model for *Listeria monocytogenes* invasion of reproductive tissues in ruminants

 A Glanvill, S Totemeyer
- Microbiota of cow's milk; distinguishing healthy, sub-clinically and clinically diseased quarters G Oikonomou, M L Bicalho, E Meira, R E Rossi, C Foditsch, V Machado, A G V Teixeira, C Santisteban, Y H Schukken, R C Bicalho
- Veterinarians' perceptions of mycotoxicosis and other silage-related diseases in ruminant livestock S Roderick, P Ward, G Eales, S Rapson, M R F Lee, J M Wilkinson
- Study of the milk metabolome profile to describe rumen function and diet utilization in dairy cows fed different types of carbohydrate and protein concentrations
 A Belanche, C J Newbold, M Doreau, P Nozière, M Beckmann, J M Moorby
- Potential use of Fourier transform infrared spectroscopy (FTIR) and flow infusion electrospray ionization mass spectroscopy (FIE-MS) as fast fingerprinting methods to predict efficiency of nitrogen utilization in cows fed different diets

 A Belanche, C J Newbold, M Gorniak, P Lebzien, M Beckmann, Jon M Moorby
- 40 Responses in blood met-haemoglobin (Met-Hb) concentrations of steers during adaptation to inclusion of nitrate in the diet and subsequent long-term feeding of nitrate

 J A Rooke, C-A Duthie, S Troy, C Broadbent, A Waterhouse, R Roehe

SUPPLEMENTS AND ENZYMES - MONOGASTRICS

- Evaluation of charcoal and honey as anti-aflatoxin feed additives in maize based broiler diets O A Adebiyi, V U Okolie-Alfred, G C Ezekiel, O A Adeniji, BA Makanjuola
- Hepatotoxicity of *Cassia fistula* extract in experimental chicks and assessment of clinical parameters I Iqbal
- Effect of protease supplementation on ileal crude protein digestibility of feather meal in broiler chickens H I Ajayi, E A Iyayi
- Precaecal digestibility of phosphorus and crude protein of sesame seed meal supplemented with phytase in broilers using regression method H Majolagbe, E A Iyayi
- Influence of pharmacological zinc oxide, phytase and phosphorus on weaned piglet growth performance and apparent faecal phosphorus digestibility

 C L Walk, P Wilcock, E Magowan
- The effect of phytase on grower pig growth performance S Laird, I Kühn, S Jagger, H Miller
- Energy metabolizability by finishing turkeys fed malted sorghum sprouts supplemented with enzyme or yeast F O Oke, A O Oso, A O Osofowora, O O Oduguwa, A V Jegede, A O Fafiolu, K-H Südekum
- Effect of enzyme and yeast supplementation on energy metabolisability by broiler finishers fed diets containing malted sorghum sprouts and wheat bran F O Oke, A O Fafiolu, V A Jegede, O O Oduguwa, A O Oso, A O Osofowora, K-H Südekum
- Effect of two different fibre sources on growth and immune function in layer pullets S M Hussein, J S Yokhana, T L Frankel
- Use of thyme (*Thymus vulgaris*) essential oil or plants to control the poultry red mite (*Dermanyssus gallinae*) in domestic fowl
 E Jackson, D George, R Shiel, J Guy

- Nutrient digestibility of diets based on wheat distillers dried grains with solubles supplemented with enzymes by broiler chickens
 - N B Rano, A S Chaudhry, S A Edwards
- The impact of enzyme inoculation on fermentation of ensiled maize cobs A T Kanengoni, R S Thomas, B D Nkosi, B Ndimba, M Chimonyo, K Dzama

COMPANION ANIMALS

- The health and welfare implications of selection, population structure and breeding in pedigree and other dogs
 - D R Sargan
- Five misconceptions about companion animals that affect welfare
 - J W S Bradshaw
- 55 An investigation into relationships of horse and rider pelvic asymmetry
 - L Browne, S J Charlton, J M Ellis, C Cunliffe
- Inheritance patterns of primary closed angle glaucoma, an emerging disease in UK Border Collies L L Farrell, A Carlisle, K Summers
- Quantification of acute phase proteins in interstitial fluid from equine body and limb wounds by the use of mass spectrometry
 - L Bundgaard, S Jacobsen, M A Sørensen, R J Beynon, V M Harman, L J Petersen, E W Deutsch, E Bendixen
- The validation of a novel protocol for the culture of equine endometrial epithelial and stromal cells A Ross, D Nash, J Paddison
- Any investigation into the relationship of pelvic misalignment on forelimb hoof size A Ireson, S J Charlton, J M Ellis, C Cunliffe
- The effect of live yeast supplementation on the canine hindgut microbial population in a continuous culture fermentation
 - K M Huson, E Pinloche, T J Wilkinson, C J Newbold
- A preliminary study to investigate the range of motion of the proximal limb joints and relationships to British Veterinary Association/Kennel Club (BVA/KC) hip score in dogs S J Charlton, J M Ellis, C Cunliffe
- Breed-specific results from surveys of three pedigree dog breeds Otterhounds, Manchester terriers and Hungarian wirehaired vizslas
 - V J Adams, K M Evans, J Sampson
- Demonstrating the value of carrying out randomised clinical trials in small animal practice: the example on the use of medetomide and/or butorphanol as preanaesthetic agents
 - V J Adams, N Girard, K Maddern, E A Leece

ADVANCES IN EQUINE SCIENCE

- 64 Updates on equine grass sickness B McGorum
- The usefulness and limitations of metformin as a medical aid alongside dietary management in laminitis-prone horses and ponies
 - A E Durham
- The effects of a high-starch or high-fibre diet on normal equine behaviour L Bulmer, S McBride, J Murray

- Post-transcriptional gene regulation in ageing equine cartilage and chondrocytes R B Fentem, M J Peffers, P D Clegg
- The date of return to cyclicity in seasonally anoestrous mares is independent of the endogenous circannual rhythm and is dependent only upon daylength which itself is depent upon latitude

 J Newcombe
- Causes of maternal and neonatal mortality within the equine breeding industry within a 43 year period R Murray, C Brigden
- The effect of mare age and reproductive status on embryo recovery rate and the quality of embryos recovered
 A Twigg-Flesner, A Newman, E Davies
- Maternal cortisol levels in Primiparous and Multiparous Thoroughbred mares during abrupt pasture weaning A Twigg-Flesner, H Stephenson, E Davies
- The use of eye blink rate and changes in behaviour as potential early indicators of pituitary pars intermedia dysfunction in the horse
 B Stephenson, A Hemmings, M Moore-Colyer

EQUINE EXERCISE AND PERFORMANCE

- Is there an association between hindlimb lameness and saddle slip in the horse? S Dyson, L Greve
- An investigation of exercise-induced changes in equine back shape L Greve, S Dyson
- Assessment of variation in movement symmetry measures in horses between trials, days and weeks based on inertial measurement units

 I Walker, T Pfau, J Perkins, R Carruthers, E Olsen
- The effects of chiropractic treatment on the range of motion of the carpus and tarsus of horses J Guest, S J Charlton, S A Hedderly, C Cunliffe
- Evaluation of horse fitness for excercies: the use of logit-log function as a model horse post-exercise heart rate recovery

 F Mata

RUMEN AND GUT METABOLISM

- Assessment of the effects of fifteen compounds from essential oil extracts on the metabolism of polyunsaturated fatty acids by rumen microorganisms *in vitro*P O Eburu, S Chikunya
- Fifect of silage additive (tannin or inoculate) on protein degradability of legume and grass silages V Taha, J Huntington, R Wilkinson, D Davies
- Evaluation of faecal NIRS for describing differences in digestibility from feed restriction and realimentation J M Bowen, K Keogh, D A Kenny, S M Waters, R Sanderson, S J Lister, R J Dewhurst
- A review of the impact of increased dietary starch concentration or addition of oils, fats, tannins or saponins in the diet on enteric methane emissions

 J McBride, S J Morrison, T Yan, A W Gordon
- Soluble lipopolysaccharide concentrations in caecal digesta but not ruminal digesta correlate with inflammation of rumen wall tissue at slaughter in commercial beef cattle at risk of SARA C A McCartney, R C Cernat, H H C Koh-Tan, E M Strachan, T J Snelling, C D Harvey, N N Jonsson, R J Wallace

- 83 Potential use of tea leaves to reduce rumen ammonia and methane productions D Ramdani, A S Chaudhry, C J Seal The effects of whole clove bud oil or its three principal constituent components on the biohydrogenation of 84 polyunsaturated fatty acids by rumen microorganisms in vitro F Gilman, Sifelani Chikunya 85 Neutral Detergent Fiber (NDF), Acid Detergent Fiber (ADF) and Acid Detergent Lignin (ADL) digestibility coefficient of WAD ewe fed selected Nigeria indigenous forage species L A Omoniyi, O A Isah, B J Adebayo, R A Olorunsola, R M Akinbode, F O Oke, C F I Onwuka Effects of bacterial and enzyme inoculation on the fermentation and aerobic stability of potato hash silage 86 B D Nkosi, T F Mutavhatsindi, J J Baloyi, R Meeske, M T Langa, I B Groenewald 87 Effect of Thapra Stylo silage treated with dried mao pomace (DMP) on feed intake and nutrient digestibility in goats S Bureenok, K Vasupen, B Saenmahayak, C Yuangklang GENOMICS AND GENETICS Accounting for herd movement characteristics in carcase trait genetic evaluations of commercial beef cattle S Wilkinson, F Morgante, M P Coffey, R Mrode, K Moore 89 Effect of feed restriction and subsequent compensatory growth on the transcriptional profile of hepatic tissue in Holstein Friesian bulls K Keogh, D A Kenny, A K Kelly, P Cormican, S M Waters 90 The effect of feed restriction and realimentation on the transcriptome of bovine jejunal epithelium E O'Shea, S M Waters, A K Kelly, P Cormican, K Keogh, D A Kenny 91 Differential gene expression of LIM domain proteins in two divergent growing muscles of broiler chicken (Ross 308 genotype) C Olomu, J Brameld, T Parr, J Wiseman 92 Environmental sensitivity of Texel sheep estimated using reaction norms A McLaren, S Brotherstone, N R Lambe, J Conington, R Mrode, L Bunger 93 Testing new options for selecting sheep that are more resistant to internal parasites J Conington, N Lambe, R Shaw, S Cleland, L Bunger 94 Effect of residual feed intake phenotype on the expression of genes regulating oxidative phosphorylation in the liver and muscle of beef cattle H Marks, D A Kenny, M McGee, C Fitzsimons, S Waters DAIRY CATTLE FEED, MANAGEMENT AND PRODUCTION 95 Gaseous emissions, rumen fermentation and animal performance of dairy cows supplemented with linseed oil or nitrate J B Veneman, K J Hart, J M Moorby, C L Faulkner, C J Newbold 96 Influence of time of access to pasture and provision of a total mixed ration on the intake, milk fatty acid profile and methane production of high yielding dairy cows J Mufungwe, S M Rutter, S Birch, J A Huntington, R G Wilkinson, L A Sinclair
- 97 A comparison of enteric methane emissions by Holstein-Friesian dairy cows and crossbred/Norwegian dairy cows
 L Dong, T Yan, C P Ferris, D A McDowell
- 98 The effect of concentrate feed rate on the performance of grazing dairy cows A J Dale, A Gordon, C P Ferris

99 Does the 305 day lactation total reflect dairy cow production potential? R Miller, J Scaife, T Whittaker Hepatic copper status and performance of dairy cows fed copper sulphate or a copper containing rumen bolus 100 either without or with added sulphur and molybdenum L A Sinclair, S Birch, A M Mackenzie 101 The performance of grazing dairy cows offered concentrates on a 'feed-to-yield' basis, when grazed grass is assumed to sustain either a 'high', 'medium' or 'low' milk yield P J Purcell, A J Dale, A W Gordon, C P Ferris 102 The effect of concentrate feed level on the rumen pH of grazing dairy cows D Johnston, A J Dale, S Dawson, C P Ferris 103 Effect of concentrate supplementation level on enteric methane emissions from grazing dairy cows H P Jiao, A J Dale, A F Carson, S Murray, A W Gordon, C P Ferris 104 Study of the plasma metabolome to describe rumen function and diet utilization in dairy cows fed differing in carbohydrate and protein concentrations A Belanche, C J Newbold, M Doreau, P Nozière, M Beckmann, J M Moorby 105 Effect of cow genotype and concentrate feed level on enteric methane emissions from grazing dairy cows H P Jiao, A W Gordon, S Murray, A F Carson, CP Ferris

HAMMOND - MEETING THE GLOBAL FOOD CHALLENGE -

SCIENCE AND BUSINESS IN PARTNERSHIP

- Preparing an agri business strategy (plants) for the challenges of 2020
- 107 Opportunities and challenges in animal nutrition L A den Hartog
- Social challenges facing animal industry and business in supporting global food provision C Leeuwis

LARGE SCALE PRODUCTION

- 109 Embracing Technology D Speller
- Is there any link between herd size and welfare of pigs? K Knage-Rasmussen, J T Sørensen, T Rousing, H Houe
- 111 Can the UK learn to love mega-farming? A study of economic, environmental, animal welfare and social outcomes, and their impact on planning, politics and PR
 A Jackson

PRECISION LIVESTOCK FARMING

- Precision Sheep Management New approaches and future development Christina Umstatter
- Applying precision technologies to the on-farm measurement and management of grazing S M Rutter
- 114 EU Projects on precision livestock farming D Berckmans

Yo	IIN	പ്ര 1	Pt	CS

Study on the feasibility of udder conformation measures in sows 115 A Balzani, S A Edwards 116 The effect of supplementing piglet creep feed with Propyl Thiosulfinate (PTS) and Propyl Thiosulfinate Oxide (PTSO) on piglet and sow performance E Bibby, N Blackie 117 Management strategies to improve the performance of low birth weight pigs to weaning and their long term consequences S Douglas, S Edwards, I Kyriazakis 118 High specification starter diets improve the performance of low birth weight pigs to 10 weeks of age S Douglas, I Wellock, S Edwards, I Kyriazakis 119 Spray-dried porcine plasma products improve performance of enterotoxigenic Escherichia coli challenged weaner pigs J G M Houdijk, L A Smith, J Pollock, M Pelser, C A Van Vuure 120 Post weaning pig performance using different levels of starter 1 diet and impact of feed and house change on feed intakes P McMullen, A O'Connell, E Magowan, R Wregor, W Henry 121 The standardised ileal digestible lysine requirement of 7 to 16 kg weaned pigs fed antibiotic-free diet R Kahindi, J Htoo, M Nyachoti 122 Unveiling the causes of poor performance in piglets during the nursery phase S P Paredes Escobar, L A den Hartog, A J M Jansman, H M J van Hees, M W A Verstegen, W J J Gerrits 123 Effect of dietary inclusion of Saccharomyces cerevisiae (CNCM I-1079) at 2x109 cfu/kg feed on post weaned pig performance and gut morphology F Mansoor, V Demey, E Magowan BEEF MANAGEMENT AND PRODUCTION 124 Feeding behaviour, body composition traits and performance of pregnant beef suckler cows differing in phenotypic residual feed intake offered grass silage C Fitzsimons, DA Kenny, AG Fahey, M McGee 125 The effect of suckler cow genotype on energetic efficiency and maintenance energy requirements C X Zou, F J Lively, A R G Wylie, T Yan 126 Relationships between methane (CH₄) production and residual feed intake (RFI) or two divergent breeds of finishing steers offered either a concentrate-straw based diet or a silage based diet C-A Duthie, J A Rooke, J J Hyslop, D W Ross, A Waterhouse, R Roehe 127 Feed intake, animal performance and net feed efficiency (NFE) in finishing Stabiliser steers J J Hyslop, R Fuller, U Taylor, D Thirlwell, S Wareing 128 Effect of reducing the starch content of cereal based rations by the partial replacement of barley with soya hulls for intensively finished beef cattle S P Marsh, D P R Harries, E M Vickers

K Keogh, D A Kenny, A K Kelly, S M Waters

C Fitzsimons, DA Kenny, M McGee, SM Waters

Gene expression in the insulin signalling pathway in beef bulls differing in phenotypic residual feed intake

Response to in vivo glucose tolerance test in Holstein Friesian bulls during dietary restriction and subsequent

re-alimentation

offered a high concentrate diet

129

130

131	Oats for intensively finished bulls S P Marsh, D K Blenkiron, E M Vickers
132	Effect of feeding a yeast culture (Diamond V XP_{LS}) on the performance of intensively finished bulls S P Marsh, W S Pollett, A Bond
Pigs	
133	Modelling the environmental impacts of commercial pig production using Life Cycle Assessment S Mackenzie, N Ferguson, I Leinonen, I Kyriazakis
134	Meta-analysis on the effects of animal and management factors influencing feed efficiency and growth in growing and finishing pigs I Kyriazakis, S Douglas, O Szyszka, K Stoddart, S A Edwards
135	Feeding value of bean starch concentrates for growing pigs J G M Houdijk, O Olukosi
136	Increased aggression at mixing results in fewer injuries in stable social groups of pigs S Desire, S P Turner, R B D'Eath, A Doeschl-Wilson, C R G Lewis, R Roehe
137	The provision of multiple chewing ropes to pigs housed in large groups and the effects on oral fluid sample representation L L Dawson, S A Edwards
138	Pig performance and <i>Salmonella</i> prevalence pre and post slaughter when finisher pigs are offered organic acid in feed F Mansoor, G Bagdonaite, E Magowan
139	RNA degradation in tissues collected from pigs subjected to two different slaughtering methods K May, J Wiseman, J Brameld, H V Masey O'Neill, T Parr
140	Assessing animal welfare – in sow herds using data on meat inspection, medication, or sow mortality K Knage-Rasmussen, J T Sørensen, H Houe, T Rousing
141	The commercial viability of crossbreeding modern and traditional pig breeds S J Collingbourne, C J De Luna, S Chikunya, A Carter
142	Blood collection methods: Vacutainer® selection for serum or plasma mineral analysis (pigs) S C Mansbridge, N Atkins, A M Mackenzie
143	Reduction of androstenone in organic entire male pigs by reduction of weight and age R Thomsen, J T Sørensen, T Rousing
144	Primary culture of porcine epithelial cells A F Smith, Z Christoforidou, R Burt, M C Lewis, M Bailey
RABBI	TS AND GOATS
145	Comparison of the microbial population in faeces of rabbits and guinea pigs by next generation sequencing E J Crowley, J M King, T Wilkinson, H J Worgan, K M Huson, M T Rose, N R McEwan
146	<i>In vivo</i> diegestibility of diets containing fungi biodegrade cowpea husks by growing rabbits A O Adedire, A V Jegede, O O Oduguwa, M O Edema, S A Adedire, K T Akanni
147	Nutrient intake and digestibility of weaner rabbits fed graded levels of roasted pigeon pea meal K E Akande
148	Growth performance of weaned rabbits fed diets supplemented with varying levels of baker's yeast (Saccharomyces cerevisiae) B M Shehu, J O Ayo, B A Ayanwale

- 149 Multiple regression analysis for the prediction of milk yield in dairy goat herds in Greece A I Gelasakis, S Pinopoulos, I Amarantidis, R Giannakou, G Arsenos Nutritional performance of West African dwarf goats fed wild sunflower (Tithonia diversifolia) leaf meal 150 supplemented diet J A Odedire, F F Oloidi 151 Restricted feeding of goats during the last third of gestation modifies reproductive parameters in their female offspring B Laporte-Broux, C Duvaux-Ponter, S Roussel, P Chavatte-Palmer, A Eymard, A A Ponter Physiological factors affecting the electrical conductivity of goat milk 152 G Arsenos, A Gelasakis, R Giannakou, H Georgakis, M Tzavella, A Aggelidis SHEEP HEALTH 153 Factors affecting lamb mortality on a sheep breeding farm V Attoh-Kotoku, E L K Osafo, A Donkoh, M Duodu, J Nunoo, S N Aboagye 154 Breed, but not maternal under nutrition, affects markers of immune status in lambs C Ashworth, C Hogg, S Matheson, C M Dwyer, J A Rooke 155 Impact of environmental temperature on in vitro establishment rate of Teladorsagia circumcincta S Ptochos, S Athanasiadou, M R Hutchings, J G M Houdijk 156 *In vivo* validation of the antiparasitic properties of medicinal plants S Athanasiadou, A Tolera, E Debela, K Tolossa, S Terry, A Regassa, A Nurfeta, J G M Houdijk 157 Performance of three Nigerian indigenous sheep experimentally infected with Trypanosoma vivax I K Oyewusi, E B Otesile, O O Adeleye, A O Talabi **HOST-PATHOGEN INTERACTIONS** Bovine Tuberculosis: host-pathogen interactions 158 J C Hope 159 Transcriptional profiling and DNA methylation analysis of CD4+ T cells from Mycobacterium bovis infected R Doherty, R Whiston, P Cormican, C Couldrey, C O'Farrelly, K Meade 160 Dynamics of the major acute phase proteins in milk during a Streptococcus uberis mastitis challenge F C Thomas, R Tassi, T McNeilly, R Zadoks, M M Waterston, H Haining, P D Eckersall 161 Host responses to virulent and avirulent strains of *Clostridium perfringens* as measured *in situ* in broilers K M Russell, P Kaiser, N H Sparks, V Parreira, J F Prescott, M A Mitchell, R E Clutton, T Kanellos, S Athanasiadou 162 Response to Teladorsagia circumcincta infection in Scottish Blackface lambs selected for divergent phenotypes for resistance K M McRae, B Good, J P Hanrahan, T Sweeney, M J O'Connell, O M Keane MEAT QUALITY Urinary cortisol and cortisone concentrations in Holstein Friesian young bulls as markers of pre-slaughter 163
- 163 Urinary cortisol and cortisone concentrations in Holstein Friesian young bulls as markers of pre-slaughter handling
 - J Keenan, M Mooney, B Moss, C Elliott
- 164 Characterising the fatty acid profile of beef supplied through a premium Welsh beef supply-chain S A Morgan, S A Huws, J K S Tweed, G H Evans, T D M Rowe, N D Scollan

165	The relationship between slice shear force and tenderness of beef assessed by an un-trained consumer sensory panel C R Craigie, T Wagstaff, I Cullingworth, D W Ross, C A Maltin
166	Meat quality traits of crossbred lamb loins sired by high and low muscle density rams (as measured by computer tomography) E M Price, J A Roden, I Richardson, N Clelland, W Haresign, J M Finch, GE Gardner, N D Scollan
167	Fatty acid composition of crossbred lambs loins sired by high and low muscle density rams (as measured by computer tomography) E M Price, J A Roden, J K S Tweed, W Haresign, J M Finch, G E Gardner, N D Scollan
168	Evaluation of Rosé and Cereal Beef Production for Holstein bulls S P Marsh, S J S Jones
169	From food to feed: Food industry co-products in animal nutrition as functional feed ingredients for enhanced meat quality E Kasapidou, E Sossidou, P Mitlianga
170	Effect of dietary supplementation of flaxseed on fatty acid profile in broilers H Al-Khalaifa, A Al-Nasser, S Al-Qallaf
171	Comparing chemical and amino acid profiles of four commercial freshwater fish species F Jabeen, A S Chaudhry
172	Fatty acid profiles of freshwater <i>Catla catla</i> fish harvested from upstream and downstream locations of river Ravi, Pakistan H A Shakir, J I Qazi, A S Chaudhry
EPIDEN 173	MIOLOGY/SURVEILLANCE Diagnosis and surveillance of infectious diseases in wildlife (WildTech) D Hannant, P Barrow, AB Abu-Median, L Yon, R Lea, T Giles, M Hutchings, D Gavier-Widen, C Billinis, L Petrovska, K Sachse, R Ehricht, P Mertens, A Bossers, M Artois, D Bourne, S Jackson-Morgan, E Leighton, T McNamara
174	Exploring community ecology and interactions of micro- and macroparasite infections in Ethiopian village chickens J M Bettridge, S E Lynch, M C Brena, K Melese, T Dessie, Z G Terfa, T T Desta, SP Rushton, O Hanotte, P Kaiser, P Wigley, R M Christley
175	Owner-reporting of adverse health events provides richer data than traditional veterinary-focussed data collection C A Pugh, B M de C Bronsvoort, I G Handel, D N Clements, K M Summers
176	BVD testing strategies in neonatal calves: serial application of ELISA and real time RTPCR to address the potential "diagnostic gap" R G ONeill, C Gallagher, D A Graham
177	Tuberculosis in domestic pigs in Great Britain S S Bailey, T R Crawshaw, N H Smith, C J Palgrave
178	Prevalence, risk factors and vaccination efficacy of contagious ovine ecthyma (orf) in England J Onyango, F Mata, W McCormick, S Chapman
179	Bovine tuberculosis test reactors: seek, and ye shall find! J van Dijk
180	Prevalence of gastrointestinal parasites among pigs in the Ejisu Municipality in Ghana J Atawalna, V Attoh-Kotoku, A Donkoh, R Folitse, C Amenakpor

ANIMA 182	L SCIENCE/VETERINARY SCIENCE E-learning: fad or future? J-A Murray
183	Academic staff perceptions of the importance of generic skills for veterinary graduates and the contribution of the different components of the final phase of a veterinary curriculum R Weller, S May
184	Design and validation of a computer-aided learning program to enhance students' ability to recognize lameness in the horse A Barstow, T Pfau, D M Bolt, R K Smith, R Weller
185	Demographic influences on staff and student attitudes to veterinary student support requirements K Pickles, P Kass, R Mellanby, S Rhind
186	A novel method of educating students about zoonotic disease: bringing the vets and medics together S Caddy, A Davies, E Torok
187	The impact of maths support tutorials for higher education animal science students N L J N van Veggel, J R Amory
188	On-line resources for teaching statistical methods to students of the animal sciences B T Wolf, M H Leitch
189	Academic staff perceptions of the usefulness of an embedded research project in the final phase of a clinical veterinary programme R Weller, S May
190	Analysis of the success of two live-animal assessment aids in determining readiness for slaughter in beef cattle H Scott-Browne, R J Cooke
191	Current methods used by English farmers to ascertain prime slaughter condition in beef cattle H Scott-Browne, R J Cooke
192	Could we use the Wiki approach to assist animal science/husbandry teaching and training? G E Pollott
D AIRY, 193	GENOMICS AND GENETICS Predicted energy balance for dairy cows based on National herd data S L Smith, E Wall, M P Coffey
194	Genetic parameters of mastitis related traits in dairy sheep G Bramis, G Arsenos, A Psifidi, G Banos
195	Validation of previously discovered markers for mastitis resistance in an independent population of dairy sheep A Psifidi, G Bramis, G Arsenos, G Banos
196	Estimation of genomic breeding values for milk yield in UK dairy goats S Mucha, R Mrode, M P Coffey, J Conington
197	Can limited molecular data be useful to improve a rare breed of cattle?

The efficacy of the paratuberculosis vaccine in cattle and sheep: a meta-analysis of case-control trials

G E Pollott, A Charlesworth, D C Wathes

181

F Mata, C Catt

198 Analysis of candidate innate immune genes and signalling pathways associated with resistance to mastitis in dairy cows X Chen, SJ Zhang, ZR Cheng, D Werling, DC Wathes **POULTRY** 199 Diners' attitudes towards broiler chicken welfare E Lazutkaite, J Amory 200 The long chain n-3 polyunsaturated fatty acid content of chicken breast muscle is increased by supplementation of the birds' diet with linseed oil but not folic acid C Rymer, L Dimmack, K Kleim 201 Meta-analysis of factors that affect nutrient requirements in laying period of broiler breeder hens Part 1: Developing nutrient requirement models S Honarbakhsh, M Zaghari, A Haghdoost 202 Meta-analysis of factors that affect nutrient requirements in laying period of broiler breeder hens Part 2: Developing Performance prediction models S Honarbakhsh, M Zaghari, A Haghdoost 203 Effects of feed form on dietary Aspilia africana leaf utilization by broilers O O K Oko, E A Agiang, L N Agwunobi, G D Eyoh, P O Ozung, B O Asuquo 204 A comparison of production parameters of two strains of layer hens producing brown and white hens H Al-Khalaifa, A Al-Nasser, G Ragheb, M Al-Bahouh, F Khalil 205 Effect of parental live weight on the reproductive performance of Japanese quail (cortunix cortunix japonica) I O Dudusola DAIRY REPRODUCTION AND FERTILITY 206 Evaluating the interval from calving to first service, and calving to conception in high yielding lame and nonlame Holstein-Friesian dairy cattle A Ward, J Scaife, N Blackie 207 Effect of preimplantation factor on the secretion of prostaglandin F₂ and E₂ from bovine endometrial tissue following a lipopolysaccharide challenge in vitro R E Clamp, J Paddison, D Nash, M T Rose, E R Barnea 208 Body weight change in the dry period and milk yield deviation from the expected in early lactation as indicators of transition diseases in dairy cattle G L Smith, C Mason, C J Ashworth, N C Friggens, M G G Chagunda 209 Increased beta-hydroxybutyrate production interrupts splenic immunity in dairy cows with postpartum negative energy balance Z Cheng, I Wickham, D Morris, D C Wathes 210 Enteric methane emissions from non-lactating pregnant dairy cows while grazing C P Ferris, H P Jiao, A F Carson, A W Gordon

DAIRY HEALTH, BEHAVIOUR AND WELFARE

- Lameness and other risk factors associated with hair loss on the hock, in a longitudinal study PYLim, JN Huxley, MJ Green, AR Othman, SL Potterton, J Kaler
- Locomotion score as an early diagnosis tool for lameness in Holstein cows A Kougioumtzis, G Valergakis, E Tsiamadis, G Arsenos, G Banos
- Force plate analysis as an alternative to visual lameness scoring in detection of lameness in Holstein Friesian dairy cattle

A V Sawran, G Pollott, R Weller, T Pfau

- Influence of lameness on the lying behaviour of straw housed, zero-grazed lactating Jersey cattle L Maclaurin, N Blackie
- The effect of housing system on oxidative stress of Holstein dairy cows in early lactation M A Karatzia, M Kritsepi, G E Valergakis, I L Oikonomidis, G Arsenos

DAIRY CALF NUTRITION AND MANAGEMENT

- 216 A survey of bovine colostrum management practices on Irish dairy farms C Cummins, R Sayers, I Lorenz, E Kennedy
- 217 Effects of feeding dairy heifer calves once daily from 28 days of age K Johnson, R Butler, J Cooke, DC Wathes
- A survey of current practice among dairy farmers out-wintering replacement heifers in Great Britain N E Atkins, K Walley, E C L Bleach, L A Sinclair
- 219 Relationship between enteric methane emissions, gross energy intake and live weight of Holstein Friesian heifers
 J McBride, S J Morrison, T Yan, A W Gordon
 - 3 Meditae, 5 3 Monthson, 1 Tan, 11 W Gordon
- 220 A survey of Jersey heifer calf rearing practices among UK dairy farmers E C L Bleach, J J Ashton, R Trewhella
- Evaluation of feeding high (750g/d) or standard (500g/d) levels of milk replacer on the performance of artificially reared dairy-bred beef calves to 12 weeks S P Marsh, T Webb, L C Newton, M Gould, G Cox
- Teat *versus* bucket feeding systems for calves S P Marsh, L Doyle, F C Heritage, M Gould, G Cox
- Dynamics of detectable immunity: a study of bovine herpesvirus 1 specific antibodies in the bovine neonate R G ONeill, C Gallagher, D A Graham