

Dr Rafat A.M Al Jassim, BSc, MSc, PhD
PERSONAL DATA:

- **Nationality:** Australian
- **Marital Status:** Married, 3 children (2 girls & 1 boy)

- **Work address:** School of Agriculture and Food Sciences, Faculty of Science
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EDUCATION:

- **PhD (1987)** **University of New South Wales**, Department of Wool and Animal Science, Sydney, Australia. **Specialisation:** Animal Nutrition; **Major:** Protein Nutrition
PhD Thesis: Nutritional Value of Single Cell Protein Sources for Sheep, 212 pp.

- **MSc (1978)** **University College of North Wales**, Department of Agricultural Sciences, Bangor, North Wales, UK. **Specialisation:** Animal Nutrition; **Major:** Nutrition Biochemistry
MSc Dissertation: Studies on the Absorption of Magnesium from the Stomach of the Sheep.

- **BSc (1974)** **University of Baghdad**, College of Agriculture, Department of Animal Production, Baghdad, Iraq. **Specialisation:** Agricultural Sciences; **Major:** Animal Science.

EMPLOYMENT RECORD:

- **Senior Lecturer**, Nutrition Biochemist and Gut Microbiologist, The University of Queensland, School of Agriculture and Food Sciences, Gatton QLD 4343 (February 2007 – present)
- **lecturer**, Nutrition Biochemist and Gut Microbiologist, School of Animal Studies, University of Queensland, Gatton QLD 4343 (February 2000 – 2007)
- **Senior Research Fellow**, Department of Animal Science, University of New England, Armidale NSW 2315 (August 11, 1997 – February 2000)

- **Visiting Scientist**, CSIRO Division of Animal Production, Ian Clunies Ross Laboratories, NSW 2148 (**September 1995 - August 1997**)
- **Associate Professor of Animal Nutrition**, Department of Nutrition and Animal Production, Jordan University of Science and Technology (**JUST**), Irbid, Jordan (**September 1991 - September 1995**)
- **Associate Professor of Animal Nutrition**, Department of Animal Production, College of Agriculture, University of Baghdad, Baghdad, Iraq (**November 1989 - September 1991**).
- **Assistant Professor of Animal Nutrition**, Department of Animal Production, College of Agriculture, University of Baghdad, Baghdad, Iraq (**November 1985 - November 1989**).
- **Assistant Lecturer**, Department of Animal Production, College of Agriculture, University of Baghdad, Baghdad, Iraq (**September 1978 - April 1981**).

RESEARCH INTERESTS

Major research themes

Listed below are my major two research themes and the research projects undertaken under them:

1. **Impacts of commensal gut microorganisms in large animal health and disease.**

- **Lactic acidosis in dairy cattle:** Acidosis, a major problem for cattle fed a high grain diets is caused by the production of excessive amounts of lactic acid in the rumen. Cattle in the Gippsland region, Victoria are grazing on an improved pasture of rye grass and white clover and usually receive a maize silage and grain supplement of wheat and barley, which in some cases is supplemented with virginiamycin (VM). My work aimed at investigating the problem of acidosis under the feeding conditions specified above and provide advice to dairy farmers whether to use feed additives with the supplement or not. Results of my work showed that lactic acid production is caused, not only by various thoroughly researched types of bacteria, but also by others previously identified in the rumen but not further characterised. It was clearly important to establish the contribution of the latter types of bacteria to acidosis. Based on the 16S rDNA sequence many of the isolates were closely related to other previously characterized rumen and lactic acid producing bacteria, including *Streptococcus bovis*, *Lactobacillus vitulinus*, *Butyrivibrio fibrisolvens*, *Prevotella bryantii* and *Selenomonas ruminantium*. Other isolates were closely related to as yet uncultured and uncharacterized rumen bacteria. The *in vitro* production of L- and/or D-lactate was seen with all but five of the isolates examined, many of which were also resistant to VM. Moreover, the isolation of *S. bovis* from the rumen of cattle fed grain supplemented with VM indicated that VM has a bacteriostatic rather than a bacteriocidal effect. Therefore, we were able to draw the conclusion that supplementation of grain with VM may reduce the risk of acidosis but does not prevent its occurrence in dairy cattle grazing improved pasture.

- **Metagenomic analyses of the rumen microbial ecosystem:** This is a collaborative project with CSIRO that aims at creating a library of BAC clones from the rumen in which can be accessed to identify commercially important genes such as

glycosyl hydrolases and antibacterial agents, and to also find answers to the true diversity of the rumen. The project started on March 2003.

- **Animal and dietary factors affecting the shedding of O157:H7 *Escherichia coli* from feedlot beef cattle:** This project received the faculty research enhancement grant for 2004 and started in 2005. The aim is to investigate the impact of diet change prior to slaughter, and animal factors, on the shedding of *E. coli* O157:H7. However, during the first year of the project we sought to first develop and verify a robust laboratory method for multiplex PCR assay to specifically test for *E. coli* O157:H7. During the second year of the project a total of 600 feedlot steers were screened for the shedding of *E. coli* O157 over the entire fattening period of 120 days using the multiplex PCR coupled with the immunomagnetic separation technique (IMS). Twenty-nine steers were tested positive and identified as natural shedders. Steers that were tested positive at the beginning of the experiment and continued to shed *E. coli* O157 over the test period were considered natural shedders. These steers were used in a trial to monitor the shedding of this pathogenic bacterium and study the effects of diet change and hindgut conditions on the persistency of shedding. Histological investigation was also carried out to test colonisation of the rectal mucosa by the bacterium.
- **Microbial fermentation in the stomach and large intestine of the horse: Role of bacteria on the pathogenesis of fermentative acidosis, laminitis and stomach ulceration:** Early projects dealt with bacteria responsible for the development of laminitis and fermentative acidosis in horses. The focus was on lactic acid producing bacteria that survive the acidic conditions of the stomach and large intestine in grain fed horses. We have isolated what we believe as the key L- and D-lactic acid producing bacteria. DNA sequence analysis of the 16S rDNA indicated that most of the isolates were very closely related to species from the genus *Lactobacillus*, including *Lact. salivarius*, *Lact. mucosae* and *Lact. delbrueckii*. Interestingly, some isolates were very closely related to *Mitsuokella jalaludinii*, an organism recently isolated and characterised from the rumen. A following project focused on the role of bacteria and lactic acid on the pathogenesis of stomach ulceration was carried out. The project was funded by RIRDC (RIRDC-UQ-115A). The aims of the project were, 1: to establish involvement of bacteria and their products (VFAs and lactic acid) in the pathogenesis of gastric ulceration in horses and 2: To determine the effect of contrasting dietary regimes on the microbial contribution to the build-up of lactic acid and VFAs in the non-glandular portion of the stomach. Characterisation of LAB from the equine gastrointestinal tract contributed to our understanding and management of acidosis, ulceration of the stomach and laminitis. Outcome of this work was documented in eight publications, four of which were in refereed journals.
- **Effects of abiotic and biotic factors on the dynamics of microbial communities in the equine GIT” Biodiversité des communautés microbiennes dans le gros intestin du cheval et identification des principales espèces.** Collaborative project with UPSP Nutrition et Santé Digestive des Herbivores, Dr Véronique JULLIAND, ENESAD 26, bd Dr Petitjean, BP 87999, 21079 Dijon Cedex Tél : 03.80.77.25.59 ; Fax : 03.80.77.25.84, Email : v.julliand@enesad.fr (30 000 € TTC plus a post-doctoral fellowship salary of 24 000 €). A post-doctoral position was advertised and the successful applicant will be working both at ENESAD, the French College of Agriculture at Dijon and our laboratory at Gatton. The project is scheduled to start on 2007.

- **The microbial ecology of the camel's gastrointestinal tract:** The aim is to study the microbial ecology of the foregut and the hindgut of the Arabian camel (*Camelus dromedarius*) with a view to selecting high efficiency lactate utilising bacteria and fibre degrading bacteria and fungi of commercial benefits. Identification and characterisation of the predominant lactic acid producing and utilising bacteria were carried out during the 2005-2008. Recent work in our laboratory during 2008-2009 led to the completion of the 16S rDNA library of the camel's foregut bacterial population. The bacterial diversity of fibre degrading bacteria and the effect of fibre source were also established during this year.

Outcome of this project was documented in number of research papers published in "Letters in Applied Microbiology (2004), Animal Production Science (2011) and international conference proceedings", and more papers have been prepared.

Currently two *PhD projects* are underway; one to fully investigate the bacterial diversity of total and fibre degrading bacteria and the second is to investigate the effect of co-grazing camels with cattle on the performance of cattle in tropical Northern Queensland.

2. The role of gut microbial ecology in the nutrition of domesticated and wild herbivores

- **Effect on varying levels of condensed tannin on fibre digestion and rumen microbial population in sheep:** Feeding ruminants in the tropics has been a critical issue because of the presence of phenolics in most of the forbs and shrubs of natural pastures. Effect of these phenolics especially tannins on the digestion of nutrients, particular dietary fibre, is critically important. With the objective of studying the effect of dietary tannins on different aspects of fibre digestion in the rumen have been investigated. Aspects studied are the effect of different levels of tannins in the diet on the digestibility of fibre as well as protein, effect of different levels of tannins on the fibrolytic bacterial population and the ability of fibrolytic bacteria to colonise structural plant materials with or without tannins.
- **Leucaena toxicity in ruminants:** Leucaena toxicity is caused by the amino acid mimosine and its rumen metabolite 3,4-dihydroxypyridone (3,4-DHP). Animals experiencing toxicity exhibit a variety of symptoms, but most importantly animal growth rates are suppressed by 30-50% due to appetite suppression. Leucaena toxicity in Australia was overcome in the 1980's by inoculation with the newly discovered rumen bacterium (*Synergistes jonesii*). However, recent research has demonstrated that there is an on-going problem with the effectiveness of the current source of inoculum, and with the retention of the bacterium in herds once inoculated. The leucaena toxicity project comprises up-stream research on the problem of leucaena toxicity with the objectives:
 1. Survey the incidence of clinical and sub-clinical leucaena toxicity worldwide;

2. Identify, in ruminants from different countries, the diversity of rumen bacteria capable of degrading mimosine and its degradation products 3,4-DHP and 2,3-DHP; and
3. Assemble a consortium of leucaena detoxifying bacteria to be used as an inoculum in Australia and the partner countries.

- **Utilisation of processed sorghum grains for horses:** Sorghum is not a popular grain for horses. This is mainly due to the fact that sorghum's starch is less susceptible to digestive enzymes in its intact form and therefore feeding high levels of it to horses may cause hind gut fermentation. Therefore increasing the rate and extent of starch digestion at the intestinal level by means of processing can reduce the amount of starch that enters the caecum, reduces the risk of fermentative acidosis in horses and improves its nutritional value. The processing methods used are dry rolling, steam flaking, and extruding and the measurements include total tract digestibility of dietary constituents as well as the effect of processing on the environment of the gastrointestinal tract of the horse. Outcome of this project was documented in an original paper published in "Animal Feed Science and Technology".

TEACHING INTERESTS

- Animal Nutrition
- Animal Feeds and Feeding
- Agricultural Biochemistry
- Agricultural Microbiology and Gene Technology

PROFESSIONAL AFFILIATIONS

- Society for Applied Microbiology (2009-present)
- American Dairy Science Association (2006-2009)
- American Society of Animal Science (2006-2009)
- The Nutrition Society, UK (1981-1991)
- The International Goat Association (IGA) (1991-2000)
- The Australian Society of Animal Production (2000 – present)
- The Union of Iraqi Agricultural Engineers (1974-1991)

TEACHING RESPONSIBILITIES

Undergraduate courses

- Animal Nutrition (ANIM3040)
- Agricultural Biochemistry (AGRC2001)
- Agricultural Microbiology and Gene Technology (AGRC2013)
- Nutritional Science & Technologies (PG course, ANIM7014)

Current post-graduate involvement

- Supervision:
 - Principal Advisor: **5** PhD, **1** MPhil, **1** Master Coursework students
 - Co-advisor: **2** PhD students,

SUPERVISION OF HONOURS AND GRADUATE PROJECTS

- **Mr Iswan Budy Suyub** (2009 – continuing), **PhD** program: The benefits to cattle of co-grazing with camels, cross-inoculation of cattle with beneficial camel's bacteria.
- **Mr Cemil Kurekci** (2008 – **Completed Dec 2011, granted PhD Jan 2012**), **PhD** program: Development of antimicrobial therapies against *Campylobacter jejuni* in Livestock.
- **Miss Larissa Beale** (started 2007-continuing), **PhD** project: Gastrointestinal health of newborn piglets – the acquisition of Enterobacteriaceae diversity.
- **Mr Mitchell Groove** (started March 2007 – continuing), **PhD** program: Rapid Culture-Independent Identification and Quantification of Foodborne Pathogens and Antibiotic Resistance Gene Carriage in Pig Faeces.
- **Mr Angas Asmara** (2007- **Completed November 2011**), **PhD** project: Bacterial community in the foregut of the dromedary camel
- **Miss Emma Gagen** (started 2006 - **Completed October 2010**), **PhD** program: Alternative hydrogen and carbon sequestration pathways in the gut of herbivores: a model for reducing ruminal methanogenesis.
- **Dr Dawood S. Al-Ajmi** (Started August 2003 - **Completed 2008**), **PhD** program: The shedding of O157:H7 *E. coli* in feedlot beef cattle.
- **Dr Moez B. Ghali** (Started July 2001- **Completed Sept 15 2005**), **PhD** program: The Microbial Ecology of the Camel, Identification and characterization of the predominant lactic acid producing, lactic acid utilising, and cellulolytic bacteria and protozoa.
- **Mr Juan David Hernandez**, (started 2003 - completed 2005), **MSc** program: Ruminal lactic acid producing bacteria in dairy cattle.
- **Miss Rachel Reid** (2004), **Honours** project: The construction of 16S rDNA library of cellulolytic bacteria of the horse caecum.
- **Mr John Goopy** (2002), **Honours** project: Upgrading abattoir effluents by phosphorous removal by duckweed.
- **Miss Andrea Trebbin** (2002), **Honours** project: The genetic diversity of lactic acid producing bacteria of the gastro-intestinal tract of the horse.
- **Miss Holly Stratton** (2002), **Honours** Project: Development of in vitro method for the determination DMD of the horse feedstuffs.
- **Miss Heidi Maree Weier** (1999), **Honours** project: Control of acidosis in sheep: Adaptation to high grain diet and use of virginiamycin (UNE).
- **Ms Ashwaq A. Ali** (1987-1989), **MSc** program: Seasonal variation of wool growth rate and fibre diameter in Awassi sheep (Baghdad University).
- **Mr Saad M. Al Jashami** (1987-1989), **MSc** program: Supplementation of molassed alkali-treated sugarcane bagasse with two different protein sources (Baghdad University).
- **Mr Taha K. Dana** (1987-1989), **MSc** program: Comparative study between sheep and goats on digestion and utilization of concentrate diets containing two levels of UDP (Baghdad University).

RESEARCH ACTIVITIES (CURRENT):

- Nutritional problems of intensively managed animals, Fermentative acidosis: Identification and characterisation of the major lactic acid producers in the stomach and hindgut of grain fed animals (August 1997-present).
- Gastrointestinal health of newborn piglets, commensal and pathogenic *E coli*,
- Processing of grains for dairy and beef cattle and horses (2000-present),
- The genetic diversity of cellulolytic bacteria of the horse hindgut. The genetic diversity of lactic acid producing bacteria in the gastro-intestinal tract of the horse, Role of lactic acid and lactic acid bacteria in the pathogenesis of stomach ulceration in horses,
- Upgrading of the nutritional value of date palm leaves by chemical, physical and biological treatments,
- Effect of feeding tannins rich fodder on microbial population in the rumen of sheep,
- *Leucaena* toxicity in cattle in the tropics.

RESEARCH GRANTS:

- * The microbial ecology of the gastrointestinal tract of the pig: 3 PhD Pork CRC scholarships valued at \$340,000 for 2008-2010).
- * Role of bacteria and lactic acid in the pathogenesis of gastric ulcers (RIRDC, \$120,000.00, 2004)
- * *Leucaena* toxicity in ruminants: Overcoming the key impediment to adoption, MLA, \$ 50,000, 2007-2008.
- * The effect of grain processing on the shedding of O157:H7 *E.coli* in beef cattle (Research Enhancement Program, \$ 30,000 The University of Queensland 2003).
- * Processing sorghum for horses, enzymatic digestion and hind gut fermentation, (UQ Firstlink Research Grant 2001 – 2002).
- * Encoding pig lactobacilli with enzyme genes for probiotic use. (PRDC, 2000, \$55,000)
- * Development of *in vitro* method for the determination of total tract apparent digestibility in the horse, (UQ New Staff Research Start-Up Fund 2001 - 2002, \$10,000).
- * Nutritional diseases in intensively managed animals, ARC/Pfizer Collaborative project, Australia (about \$ 350,000; 1997 - 2000).
- * Effect of fat-tail docking on energy requirements and carcass characteristics of Awassi lambs (project 30/92, The Scientific Research Deanship, JUST, \$18000).
- * Supplementation of ewe lambs with different levels of rumen undegradable protein (UDP) (project 3/93, The Scientific Research Deanship, JUST, \$15000).
- * Supplementary feeding value of urea-treated olive cake when fed to growing lambs (1993, Ministry of Agriculture, Jordan, \$ 5000).
- * Effect of fat-tail docking in ewe lambs on their growth rate, age at puberty and their subsequent reproductive and productive characteristics (project 38/94, The Scientific Research Deanship, JUST, \$ 15000).

SERVICE TO SCIENCE:

- **Editor-in-Chief**, *Journal of Camelid Science*, the official journal of the International Society of Camelid Research and development (ISOCARD).

- **Expert/Consultant:** Arab Authority for Agricultural Investment and Development, *Utilisation of date palm leaves as a fibre source for ruminants*, UAE (Nov 2001- Nov 2005).
- **Expert/Consultant:** Arab Authority for Agricultural Investment and Development, *Red meat project in Sudan* (2006- present).
- **Expert/Consultant:** Arab Authority for Agricultural Investment and Development, establish an Arab Center for Biotechnology and Genetic Engineering (ACBGE), 4-8 January 2008.
- **Lecturer/Panellist:** “Supplementary Feeding Made Easy” (A Three Day Workshop, 12-14 October 1998), UNE, Armidale, NSW Australia.

* **Reviewer:**

- Small Ruminant Research. The Journal of the International Goat Association, Elsevier, The Netherlands,
- Animal Feed Science and Technology,
- Applied and Environmental Microbiology,
- British Journal of Nutrition,
- Achieve in Animal Nutrition.
- Australian Veterinary Journal

- * **Chairman:** Workshop on the utilization of agro-industrial by-products by sheep and goats, Jordan University of Science and Technology, Irbid, Jordan, (May 1994).
- * **Expert:** The Arab Organisation for Agricultural Development, Khartoum, Sudan, *A study on plans for the genetic improvement of local cattle, sheep, and goats in the Arab countries* (March, 1989) (AOAD/90/RG/00293).
- * **Member:** Organizing Committee, Regional Symposium on the Productivity of Goats, College of Agriculture, University of Baghdad, (May 1989).
- * **Panelist:** In-country training for farmers, profitable feeding practices for dairy cattle, sheep and goats, Jordan, (November 1993).
- * **Lecturer:** Regional Training Courses: Utilization of urea and urea-treated straw by sheep. Workshop of the Mashreq project. Amman, Jordan, (March 1992).
Nutrition of dairy cattle in Jordan. Workshop on the productivity of dairy cattle in the Arab countries. Amman, Jordan, (June 1993). Energy and protein requirements of sheep and goats. Workshop of Mashreq project. UNDP/ICARDA.
- * **Agriculture Engineer,** Ministry of Defence, Iraq (1974-1976).

AWARDS, FELLOWSHIPS AND HONOURS

- * **Doctoral Fellowship,** Ministry of Higher Education and Scientific Research (University of New South Wales, (1981-1985).
- * **MSc Fellowship,** Ministry of Higher Education and Scientific Research, (University College of North Wales, Bangor, UK, (1976-78).
- * **Chairman’s Awards to top ten graduating students,** Department of Animal Resources, College of Agriculture, Baghdad University (1974).

SKILLS

- * Molecular microbiology techniques.
- * Gut microbiology techniques
- * Surgery (Ruminal and Abomasal Cannulation).
- * Double Marker technique for digesta flow in ruminants (^{51}Cr and ^{103}Ru)
- * Microbial protein synthesis in the rumen (^{35}S)
- * Feed Analysis and diet formulation

PUBLICATIONS (peer refereed original full papers only)

2011

1. Anjas A. Samsudin, Paul N. Evans, André-Denis G. Wright, **Rafat Al Jassim**. 2011. Molecular diversity of the foregut bacteria community in the dromedary camel (*Camelus dromedarius*), *Environmental Microbiology*, 13 (11): 3024-3035.
2. I. A. Alhidary, S. Shini, **R. A. M. Al Jassim** and J. B. Gaughan. 2011. Physiological responses of Australian Merino wethers exposed to high heat load. *J. Anim. Sci.*, published online August 12, 2011.
3. Cemil Kurekci, Sharon L. Bishop-Hurley, Philip E. Vercoe, Zoey Durmic, **Rafat A. M. Al Jassim**, Christopher S. McSweeney. 2011. Screening of Australian plants for antimicrobial activity against *Campylobacter jejuni*. *Phytotherapy Research*. 2011. Article first published online: 20 May 2011 DOI: 10.1002/ptr.3526.
4. Ghali, M. B., Scott, P. T., Alhadrami, G. A. and **Al Jassim, R. A. M.** 2011. Identification and characterisation of the predominant lactic acid producing and utilising bacteria in the foregut of the feral camel (*Camelus dromedarius*) in Australia. *Animal Production Science*. 2011, 51:597-604.

2010

5. Gagen, E. J., Denman S. E., Padmanabha, J., Al Jassim, R., McSweeney, C. S. 2010. Functional gene analysis suggests different acetogen populations in the bovine rumen and tammar wallaby forestomach, *Applied and Environmental Microbiology*. 76 (23): 7785–7795.
6. James Chin, Sam Abraham, Ren Zhang and **Rafat Al Jassim**. 2010. Diarrheagenic *Escherichia coli* Pathotypes (DEP) including Enterohaemorrhagic (EHEC)/Shiga-toxin *E coli* (STEC). In: *PCR for Clinical microbiology: An Australian and international Perspective*. M. Schuller et al. (eds.), Springer Dordrecht Heidelberg London New York. pp. 149-155.

2009-2000

7. **Rafat A.M. Al Jassim** and Frank M. Andrews. 2009. The Bacterial Community of the Horse Gastrointestinal Tract and its Relation to Fermentative Acidosis, Laminitis, Colic, and Stomach Ulcers. *Vet Clin Equine*, **25**: 199-215.

8. **Rafat Al Jassim**, Thomas McGowan, Frank Andrews and Catherine McGowan. **2008**. Gastric Ulceration in Horses, The role of bacteria and lactic acid. *Rural Industries Research and Development Corporation: Publication No. 08/033*.
9. J.D. Hernandez, P.T. Scott, R.W. Shephard and **R.A.M. Al Jassim**. **2008**. The characterization of lactic acid producing bacteria from the rumen of dairy cattle grazing on improved pasture supplemented with wheat and barley grain. *Journal of Applied Microbiology* **104**: 1754-1763.
10. F.M. Andrews, B.R. Buchanan, S.B. Elliott, R.A.M. Al Jassim, C.M. McGowan, and A.M. Saxton. **2008**. In vitro effects of hydrochloric and lactic acids on bioelectric properties of equine gastric squamous mucosa. *Equine Veterinary Journal* **40(4)**: 301- 305.
11. **Rafat A.M. Al Jassim**. 2007. Animal Biotechnology: Potential Applications and benefits for Arab countries. *Journal of Agricultural Investment* **5**: 82-85.
12. **Rafat A.M. Al Jassim**. 2007. Nutritional disorders in the horse. *Proceedings of the 7th International Symposium of the Nutrition of the Herbivore*. Beijing, China, pp.397-410.
13. **Rafat A.M. Al Jassim**. 2007. Lactic acid bacteria in sheep. *Chinese Agricultural Science Bulletin*, Special Issue, **23**:100-107.
14. **R.A.M. Al Jassim**, C.M. McGowan and F.M. Andrews. **2007**. Bacterial diversity and role of lactic acid in the pathogenesis of acid injury in the non-glandular region of the equine stomach. *Recent Advances in Animal Nutrition in Australia*, **16**: 85-91.
15. Gabriel J. Milinovich, Darren J. Trott, Paul C. Burrell, Emma L. Croser, **Rafat A.M. Al Jassim**, John M. Morton, Andrew W. van Eps and Christopher C. Pollitt. **2007**. Fluorescence in situ hybridization analysis of hindgut bacteria associated with the development of equine laminitis. *Environmental Microbiology*, **9**: 2090-2100.
16. M. Choct, M. Sinlae, **R.A.M. Al Jassim** and D. Pettersson. 2006. Using enzymes to reduce the between-bird variability in the energy value of wheat and as an alternative to antibiotics in poultry feed. *Australian Journal of Agricultural Research*, **57**: 1017-1021.
17. Al-Ajmi, D., Padmanabha, J., Denman, S., Gilbert, R. A., **Al Jassim, R. A. M.** and McSweeney C. S. 2006. Evaluation of a PCR detection method for *E. coli* O157:H7/H- in bovine faecal samples. *Letters in Applied Microbiology* **42**:386-391.
18. Gabriel J. Milinovich, Darren J. Trott, Paul C. Burrell, Andrew W. van Eps, Martin B. Thoenfer, Linda L. Blackall, **Rafat A. M. Al Jassim**, J. M. Morton and C. C.

- Pollitt, 2006. Changes in Equine Hindgut Bacterial Populations during Oligofructose-Induced Laminitis. *Environmental Microbiology*. **8**: 885-898.
19. **Al Jassim, R.A.M.** 2006. Supplementary feeding of horses with processed sorghum grains and oats. *Animal Feed Science and Technology*, 125: 33-44.
 20. **Al Jassim, R. A.M.**, Scott, P. T., Trebbin, A. L., Trott, D., and Pollitt, C. C. 2005. The genetic diversity of lactic acid producing bacteria in the equine gastrointestinal tract. *FEMS Microbiology Letters*, *FEMS Microbiology Letters* 248:75-81.
 21. **Al Jassim, R. A.M.**, Scott, P. T., Krause D., Denman, S., and McSweeney C. 2005. The diversity of cellulolytic and lactic acid bacteria of the gastro-intestinal tract of the horse. *Recent Advances in Animal Nutrition in Australia*, 15: 155-163.
 22. M. B. Ghali, P. T. Scott and **R. A. M. Al Jassim** (2004). Characterisation of *Streptococcus bovis* from the rumen of the dromedary camel and Rusa deer. *Letters in Applied Microbiology* **39**: 341-346.
 23. J. P. Goopy, P. J. Murray, A. T. Lisle and **R. A. M. Al Jassim** (2004). Use of Chemical and Biological Agents to Improve Water Quality of Effluent Discharge from Abattoirs. *Asian-Australian Journal of Animal Science*.17: 137-145.
 24. **R. A. M. Al Jassim**, G. L. R. Gordon and J. B. Rowe (2003). The effect of basal diet on lactate-producing bacteria and the susceptibility of sheep to lactic acidosis. *Animal Science*.77: 459-469.
 25. **R. A. M. Al Jassim** (2003). *Lactobacillus ruminis* is a pre-dominant lactic acid producing bacterium in the caecum and rectum of the pig. *Letters in Applied Microbiology*. **37**: 213-217.
 26. **R.A.M. Al Jassim**, G. Brown, E.D. Salman and A. Abodabos (2002). Effect of tail docking in Awassi lambs on metabolizable energy requirements and chemical composition of carcasses. *Animal Science*. **75**: 359-366.

Others

27. **Al Jassim, R.A.M.**, Aziz, D.I., Zorah, K. and Black, J.L. (1999). Effect of concentrate feeding on milk yield and body-weight change of Awassi ewes and the growth of their lambs. *Animal Science*. 69: 441-446.
28. **Al Jassim, R.A.M.**, Ereifeij, K.I., Shibli, R.A. and Abudabos, A. (1998). Utilization of concentrate diets containing acorns (*Quercus aegilops* and *Quercus coccifera*) and urea by growing Awassi lambs. *Small Ruminant Research*. 29: 289-293.
29. **Al Jassim, R.A.M.**, Awadeh, F.T. and Abodabos, A. (1997). Supplementary feeding value of urea-treated olive cake when fed to growing Awassi lambs. *Animal Feed Science and Technology*.64: 287-292.

30. **Al Jassim, R.A.M.**, Hassan, S.A. and Al-Ani, A.N. (1996). Metabolizable energy requirements for maintenance and growth of Awassi lambs. *Small Ruminant Research*. 20: 239-245.
31. **Al Jassim, R.A.M.**, Hassan, A.A. and AlKass, J.E. (1997). Seasonal variation in wool growth rate of Awassi sheep in Iraq. *Indian Journal of Animal Science*. 67: 913-915, October 1997.
32. **Al Jassim, RAM and Khamas WA.** (1997). Gynecomastia and galactorrhea in a goat buck. (short communication) *Aust Vet J*, Vol. 75, No 9, September 1997; 669-670.
33. **Al Jassim, R.A.M.**, Hassan, S.A., Al-Ani, A.N. and Dana, T.K. (1991). Effect of rumen undegradable protein supplementation on digestion and nitrogen balance in sheep and goats. *Small Ruminant Research* 5: 57-63.
34. **Al Jassim, R.A.M.**, Al-Ani, A.N., Hassan, S.A., Dana, T.K. and Al-Jarian, L.J. (1991). Effect of dietary supplementation with rumen undegradable on carcass characteristics of Iraqi Awassi lambs and desert goats. *Small Ruminant Research* 4: 269-275.
35. Hassan, S.A., **Al Jassim, R.A.M.**, Al-Ani, A.N. and Abdullah, N.S. (1991). Effect of dietary supplement of rumen undegradable protein upon carcass composition of fat tail Awassi sheep. *Small Ruminant Research* 5: 65-74.
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