

## CONTENTS

### ANIMAL WELL-BEING AND BEHAVIOR

- Changes with age (from 0 to 37 D) in tibiae bone mineralization, chemical composition and structural organization in broiler chickens  
**Estefania Sanchez-Rodriguez, Cristina Benavides-Reyes, Cibele Torres, Nazaret Dominguez-Gasca, Ana I. Garcia-Ruiz, Santiago Gonzalez-Lopez, and Alejandro B. Rodriguez-Navarro**.....5215
- Comparison of the broody behavior characteristics of different breeds of geese  
**Y. Yao, Y. Z. Yang, T. T. Gu, Z. F. Cao, W. M. Zhao, H. R. Qin, Q. Xu, and G. H. Chen**.....5226
- Improving intra- and inter-observer repeatability and accuracy of keel bone assessment by training with radiographs  
**Sabine G. Gebhardt-Henrich, Christina Rufener, and Ariane Stratmann** ..... 5234
- Effects of exercise on carcass composition, meat quality, and mRNA expression profiles in breast muscle of a Chinese indigenous chicken breed  
**Xing Guo, Jiangxian Wang, Hong Chen, Hu Su, Zhicheng Wang, Yi Wan, Yuanyuan Huang, and Runshen Jiang** ..... 5241
- A novel environmental enrichment device improved broiler performance without sacrificing bird physiological or environmental quality measures  
**M. M. Meyer, A. K. Johnson, and E. A. Bobeck**.....5247
- Changes in the cecal microbiota of laying hens during heat stress is mainly associated with reduced feed intake  
**Shuang Xing, Xuejie Wang, Huajie Diao, Minhong Zhang, Ying Zhou, and Jinghai Feng**..... 5257

### GENETICS AND GENOMICS

- Expression of *MSTN* gene and its correlation with pectoralis muscle fiber traits in the domestic pigeons (*Columba livia*)  
**H. H. Liu, H. G. Mao, X. Y. Dong, H. Y. Cao, K. Liu, and Z. Z. Yin**..... 5265
- A genomic inference of the White Plymouth Rock genealogy  
**Y. Guo, M. Lillie, Y. Zan, J. Beranger, A. Martin, C. F. Honaker, P. B. Siegel, and Ö. Carlborg** ..... 5272
- Mhc-B haplotypes in "Campero-Inta" chicken synthetic line  
**Gabriela M. Iglesias, Zulma E. Canet, Horacio Cantaro, María C. Miquel, Julián E. Melo, Marcia M. Miller, Mark E. Berres, and Janet E. Fulton**.....5281
- Egg-laying and brooding stage-specific hormonal response and transcriptional regulation in pituitary of Muscovy duck (*Cairina moschata*)  
**Pengfei Ye, Kai Ge, Min Li, Lei Yang, Sihua Jin, Cheng Zhang, Xingyong Chen, and Zhaoyu Geng**..... 5287

### IMMUNOLOGY, HEALTH AND DISEASE

- The *netB*-positive *Clostridium perfringens* in the experimental induction of necrotic enteritis with or without predisposing factors  
**Wen-Yuan Yang, Yue-Jia Lee, Hsin-Yi Lu, Scott L Branton, Chung-Hsi Chou, and Chinling Wang** ..... 5297
- Differential expression of pro-inflammatory and anti-inflammatory genes of layer chicken bursa after experimental infection with infectious bursal disease virus  
**Zhi-Yong Xu, Yan Yu, Yan Liu, Chang-Bo Ou, Yan-Hong Zhang, Ting-Yu Liu, Qiu-Xia Wang, and Jin-You Ma**..... 5307

Novel carbon quantum dots can serve as an excellent adjuvant for the gp85 protein vaccine against avian leukosis virus subgroup J in chickens Jia Cheng, Yuliang Xu, Dong Zhou, Kangping Liu, Na Geng, Jianwei Lu, Yongxia Liu, and Jianzhu Liu.....	5315
Genetic and pathogenic characteristics of newly emerging avian reovirus from infected chickens with clinical arthritis in China Xiaohui Zhang, Xiangdong Lei, Lifang Ma, Jiabin Wu, and Endong Bao.....	5321
Development of a novel in ovo challenge model for virulent <i>Escherichia coli</i> strains B. D. Graham, C. M. Selby, K. D. Teague, L. E. Graham, C. N. Vuong, J. D. Latorre, G. Tellez, and B. M. Hargis.....	5330
Molecular characteristics and pathogenicity analysis of QX-like avian infectious bronchitis virus isolated in China in 2017 and 2018 Shihong Yan, Yali Sun, Xiuying Huang, Wenfeng Jia, Deqiong Xie, and Guozhong Zhang.....	5336
Transcriptomic analysis of early B-cell development in the chicken embryo Nikhil K. Nuthalapati, Jeffrey D. Evans, Robert L. Taylor, Jr., Scott L. Branton, Bindu Nanduri, and Gregory T. Pharr.....	5342
Rapid and visible detection of <i>Mycoplasma synoviae</i> using a novel polymerase spiral reaction assay Qianqian Wu, Xin Xu, Qinxi Chen, Kejing Zuo, Yiting Zhou, Zhibin Zhang, Yunchao Kan, Lunguang Yao, Jun Ji, Yingzuo Bi, and Qingmei Xie.....	5355
Gut microbiota dysbiosis increases the risk of visceral gout in goslings through translocation of gut-derived lipopolysaccharide Yumeng Xi, Junshu Yan, Mingyang Li, Shijia Ying, and Zhendan Shi.....	5361
Molecular epidemiology of infectious bronchitis virus and avian metapneumovirus in Greece Marianna Andreopoulou, Giovanni Franzo, Claudia M. Tucciarone, Zoi Prentza, Konstantinos C. Koutoulis, Mattia Cecchinato, and Ilias Chaligianni.....	5374
Comparison of the frequency of patho-anatomic findings in laying hens with findings in broiler chickens and turkeys detected during post-mortem veterinary inspection Vladimir Vecerek, Lenka Vecerkova, and Eva Voslarova.....	5385
Effect of <i>Bacillus subtilis</i> DSM 32315 on the intestinal structural integrity and growth performance of broiler chickens under necrotic enteritis challenge A. O. Sokale, A. Menconi, G. F. Mathis, B. Lumpkins, M. D. Sims, R. A. Whelan, and K. Doranalli.....	5392
Simultaneous and visual detection of infectious bronchitis virus and Newcastle disease virus by multiple LAMP and lateral flow dipstick Xuan Wu, Zengxu Song, Xiwen Zhai, Lei Zuo, Xueran Mei, Rong Xiang, Zhuangzhuang Kang, Long Zhou, and Hongning Wang.....	5401
Resistance to fenbendazole in <i>Ascaridia dissimilis</i> , an important nematode parasite of turkeys James B. Collins, Brian Jordan, Luke Baldwin, Claude Hebron, Kelsey Paras, Anand N. Vidyashankar, and Ray M. Kaplan.....	5412
Molecular characteristic of antimicrobial resistance of <i>Salmonella</i> Gallinarum isolates from chickens in Korea, 2014 to 2018 Kwang Won Seo, Jeom Joo Kim, In Pil Mo, and Young Ju Lee.....	5416
In vivo assessment of molybdenum and cadmium co-induced the mRNA levels of heat shock proteins, inflammatory cytokines and apoptosis in shaoxing duck ( <i>Anas platyrhynchos</i> ) testicles Xueyan Dai, Gaohui Nie, Huabin Cao, Chenghong Xing, Guoliang Hu, and Caiying Zhang.....	5424

## MANAGEMENT AND PRODUCTION

Heat shock protein 70 protects the quail cecum against oxidant stress, inflammatory injury, and microbiota imbalance induced by cold stress Chunpeng Liu, Maria Tabassum Chaudhry, Dan Zhao, Tong Lin, Yunbo Tian, and Jing Fu.....	5432
Nanostructural basis for the gloss of chicken eggshells Quanlin Li, Kun Wang, Jiangxia Zheng, Congjiao Sun, Changrong Ge, Ning Yang, and Guiyun Xu.....	5446

Challenges and chicken production status of poultry producers in Bishoftu, Ethiopia Yared A. Ebsa, S. Harpal, and Gebeyehu G. Negia.....	5452
Comparison between a commercial blend of functional oils and monensin on the performance and microbiota of coccidiosis-challenged broilers P. O. Moraes, K. M. Cardinal, F. L. Gouvêa, B. Schroeder, M. S. Ceron, R. Lunedo, A. P. G. Frazzon, J. Frazzon, and A. M. L. Ribeiro.....	5456
Effect of feed restriction timing on live performance, breast myopathy occurrence, and muscle fiber degeneration in 2 broiler chicken genetic lines F. Gratta, M. Birolo, R. Sacchetto, G. Radaelli, G. Xiccato, C. Ballarin, D. Bertotto, A. Piccirillo, M. Petracchi, L. Maertens, and A. Trocino.....	5465
Effects of reducing growth rate via diet dilution on bone mineralization, performance and carcass yield of coccidia-infected broilers Idiegeberanoise Oikeh, Panagiotis Sakkas, James Taylor, Ilias Giannenas, Damer P. Blake, and Ilias Kyriazakis.....	5477
Comparison of multiple methods for induction of necrotic enteritis in broilers: II. Impact on the growth curve K. M. Chasser, K. M. Wilson, W. N. Briggs, A. F. Duff, and L. R. Bielke.....	5488

## METABOLISM AND NUTRITION

Effect of pelleting and different feeding programs on growth performance, carcass yield, and nutrient digestibility in broiler chickens Andréia Massuquetto, Josiane C. Panisson, Francielle O. Marx, Diego Surek, Everton L. Krabbe, and Alex Maiorka.....	5497
Impact of corn particle size on nutrient digestibility varies depending on bird type A. W. Mtei, M. R. Abdollahi, N. M. Schreurs, and V. Ravindran.....	5504
Leucine promotes the growth of squabs by increasing crop milk protein synthesis through the TOR signaling pathway in the domestic pigeon ( <i>Columba livia</i> ) W. Y. Xie, Z. Fu, N. X. Pan, H. C. Yan, X. Q. Wang, and C. Q. Gao.....	5514
Evaluation of novel protease enzymes on growth performance and nutrient digestibility of poultry: enzyme dose response C. L. Walk, K. Juntunen, M. Paloheimo, and D. R. Ledoux.....	5525
Effects of in ovo feeding of L-lysine on hatchability, hatching time, and early post-hatch development in domestic pigeons ( <i>Columba livia</i> ) M. K. Zhu, X. Y. Zhang, X. Y. Dong, and X. T. Zou.....	5533
Growth performance and gastrointestinal responses in heavy Tom turkeys fed antibiotic free corn-soybean meal diets supplemented with multiple doses of a single strain <i>Bacillus subtilis</i> probiotic (DSM29784) M. Mohammadigheisar, R. B. Shirley, J. Barton, A. Welsher, P. Thiery, and E. Kiarie.....	5541
Determination of aflatoxin biomarkers in excreta and ileal content of chickens N. Jurišić, H. E. Schwartz-Zimmermann, E. Kunz-Vekiru, W. D. Moll, W. Schweiger, J. Fowler, and F. Berthiller.....	5551
Phytate degradation in gnotobiotic broiler chickens and effects of dietary supplements of phosphorus, calcium, and phytase Vera Sommerfeld, Andrew G. Van Kessel, Henry L. Classen, Margit Schollenberger, Imke Kühn, and Markus Rodehutschord.....	5562
Effects of a combination of xylanase, amylase and protease, and probiotics on major nutrients including amino acids and non-starch polysaccharides utilization in broilers fed different level of fibers A. K. Singh, U. P. Tiwari, J. D. Berrocso, Y. Dersjant-Li, A. Awati, and R. Jha.....	5571
Studies on the measurement of ileal calcium digestibility of calcium sources in broiler chickens L. S. David, M. R. Abdollahi, G. Ravindran, C. L. Walk, and V. Ravindran.....	5582

Dietary methionine deficiency reduces laying performances of female common ducks and impacts traits of interest of their mule ducklings L. Bodin, A. Sécula, H. Chapuis, A. Cornuez, M. Lessire, E. Cobo, S. Marie-Louise, C. M. D. Bonnefont, J. Barrieu, F. Mercierand, C. Bravo, H. Manse, MC. Le Bourhis, X. Martin, F. Pitel, JM. Brun, and M. Morisson,.....	5590
Crude soybean lecithin as alternative energy source for broiler chicken diets A. Viñado, L. Castillejos, R. Rodriguez-Sanchez, and A. C. Barroeta.....	5601
Analysis of mechanical properties of bones and tendons shows that modern hybrid rye can be introduced to corn-wheat based diet in broiler chickens as an alternative energy source irrespective of xylanase supplementation S. Muszyński, S. Świątkiewicz, A. Arczewska-Włosek, P. Dobrowolski, J. L. Valverde Piedra, M. B. Arciszewski, S. Szymańczyk, A. Zacharko-Siembida, S. Kowalik, M. Hulaś-Stasiak, A. Tomczyk-Warunek, T. Schwarz, and E. Tomaszewska.....	5613
Effect of dietary supplementation of <i>Bacillus subtilis</i> DSM29784 on hen performance, egg quality indices, and apparent retention of dietary components in laying hens from 19 to 48 weeks of age M. Neijat, R. B. Shirley, J. Barton, P. Thiery, A. Welsher, and E. Kiarie.....	5622
Fermentation of flaxseed cake increases its nutritional value and utilization in ducklings S. S. Zhai, T. Zhou, M. M. Li, Y. W. Zhu, M. C. Li, P. S. Feng, X. F. Zhang, H. Ye, W. C. Wang, and L. Yang.....	5636
Fermented soybean meal ameliorates <i>Salmonella</i> Typhimurium infection in young broiler chickens V. Jazi, H. Mohebodini, A. Ashayerizadeh, A. Shabani, and R. Berekatani.....	5648
Choline supplementation alters egg production performance and hepatic oxidative status of laying hens fed high-docosahexaenoic acid microalgae Joseph A. Yonke and Gita Cherian.....	5661
Response of broiler chickens to dietary soybean bioactive peptide and coccidia challenge S. O. Osho, W. W. Xiao, and O. Adeola.....	5669
Interactions between dietary calcium and phosphorus level, and vitamin D source on bone mineralization, performance, and intestinal morphology of coccidia-infected broilers Idiegberanoise Oikeh, Panagiotis Sakkas, Damer P. Blake, and Ilias Kyriazakis.....	5679
Effect of anti-fibroblast growth factor receptor 1 antibodies on phosphorus metabolism in laying hens and their progeny chicks Zhouzheng Ren, Daniel E. Bütz, Mitchell Ramuta, Keying Zhang, Qiufeng Zeng, Xin Yang, Xiaojun Yang, Thomas D. Crenshaw, and Mark E. Cook.....	5691
Prececal amino acid digestibility and phytate degradation in broiler chickens when using different oilseed meals, phytase and protease supplements in the feed W. Siegert, T. Zuber, V. Sommerfeld, J. Krieg, D. Feuerstein, U. Kurrle, and M. Rodehutschord.....	5700
Effects of dietary perilla seed oil supplementation on lipid metabolism, meat quality, and fatty acid profiles in Yellow-feathered chickens Xiaoyan Cui, Zhongyong Gou, Qiuli Fan, Long Li, Xiajing Lin, Yibing Wang, Shouqun Jiang, and Zongyong Jiang.....	5714
Evolution of liver fattening and foie gras technological yield during the overfeeding period in mule duck Cécile MD. Bonnefont, Caroline Molette, Franck Lavigne, Héléne Manse, Céline Bravo, Bara Lo, Hervé Rémignon, Julien Arroyo, and Michel Bouillier-Oudot.....	5724
Effects of dietary lysine on productivity, reproductive performance, protein and lipid metabolism-related gene expression in laying duck breeders D. Ruan, A. M. Fouad, Y. N. Zhang, S. Wang, W. Chen, W. G. Xia, S. Q. Jiang, L. Yang, and C. T. Zheng.....	5734
Energy efficiency and net energy prediction of feed in laying hens S. Barzegar, S.-B. Wu, J. Noblet, M. Choct, and R. A. Swick.....	5746
Effects of fat type and emulsifier in feed on growth performance, slaughter traits, and lipid metabolism of Cherry Valley ducks X. Q. Hu, W. B. Wang, L. Liu, C. Wang, W. Feng, Q. P. Luo, R Han, and X. D. Wang.....	5759

Influence of egg weight and inclusion of oat hulls in the diet on digestive tract traits and growth performance of brown pullets reared under stress conditions J. García, G. Fondevila, L. Cámara, R. E. Scappaticcio, L. Aguirre, and G. G. Mateos.....	5767
Evaluation of the nutritive value of legume alternatives to soybean meal for broiler chickens Oluyinka A. Olukosi, Robin L. Walker, and Jos. G. M. Houdijk.....	5778
The efficacy of 2 phytases on inositol phosphate degradation in different segments of the gastrointestinal tract, calcium and phosphorus digestibility, and bone quality of broilers A. Bello, Y. Dersjant-Li, and D. R. Korver.....	5789
The dietary supplementation of canthaxanthin in combination with 25OHD <sub>3</sub> results in reproductive, performance, and progeny quality gains in broiler breeders L. F. Araujo, C. S. S. Araujo, R. J. G. Pereira, L. C. Bittencourt, C. C. Silva, F. Cisneros, R. G. Hermes, Y. G. A. Sartore, and M. T. Dias.....	5801
Changes in cecum microbial community in response to total sulfur amino acid (TSAA: DL-methionine) in antibiotic-free and supplemented poultry birds S. Kumar, P. Adhikari, B. Oakley, and W. K. Kim.....	5809
Effect of fiber source and particle size on chick performance and nutrient utilization R. A. Donadelli, D. A. Stone, C. G. Aldrich, and R. S. Beyer.....	5820
Effects of dietary metabolizable energy levels and beak trimming on the performance, egg quality, and economic viability of layers Carlos A. Granghelli, Maria F. C. Burbarelli, Karoline D. Lelis, Paulo H. Pelissari, Natália B. P. Utimi, Brunna G. S. Leite, Fabricia A. Roque, Priscila S. Zorzetto, Julio C. C. Balieiro, Lúcio F. Araújo, and Cristiane S. S. Araújo.....	5831
In vitro characterization and analysis of probiotic species in the chicken intestine by real-time polymerase chain reaction Revathi Shanmugasundaram, Mohamad Mortada, G. Raj Murugesan, and Ramesh K. Selvaraj.....	5840
Protective Effect of Vitamin E on laying performance, antioxidant capacity, and immunity in laying hens challenged with <i>Salmonella</i> Enteritidis Y. J. Liu, L. H. Zhao, R. Mosenthin, J. Y. Zhang, C. Ji, and Q. G. Ma.....	5847
Effects of functional oils on performance and carcass characteristics of broilers under two different temperature environments J. Torrent, J. Arce Menocal, C. López Coello, and E. Ávila González.....	5855
Utilization of corn-based diets supplemented with an exogenous $\alpha$ -amylase for broilers C. Stefanello, S. L. Vieira, P. Soster, B. M. Dos Santos, Y. K. Dalmoro, A. Favero, and A. J. Cowieson.....	5862
Effects of dietary energy and methionine on growth performance and carcass traits of growing Pekin ducks from 15 to 42 days of age Y. B. Wu, J. Tang, M. Xie, R. Zhao, W. Huang, Q. Zhang, and S. S. Hou.....	5870
Metabolizable energy of corn, soybean meal and wheat for laying hens Shahram Barzegar, Shu-Biao Wu, Jean Noblet, and Robert A. Swick.....	5876

## MICROBIOLOGY AND FOOD SAFETY

Prevalence and genetic diversity of <i>Campylobacter</i> spp. in the production chain of broiler chickens in Lebanon and its association with the intestinal protozoan <i>Blastocystis</i> sp. S. Greige, K. Rivoal, M. Osman, D. El Safadi, F. Dabboussi, R. El Hage, E. Viscogliosi, M. Hamze, and M. Chemaly.....	5883
Molecular characterization of antimicrobial-resistant <i>Enterococcus faecalis</i> and <i>Enterococcus faecium</i> isolated from layer parent stock Yeong Bin Kim, Kwang Won Seo, Jong Bo Shim, Se hyun Son, Eun Bi Noh, and Young Ju Lee.....	5892
Plasmid-mediated quinolone resistance in <i>Escherichia coli</i> isolates from commercial broiler chickens and selection of fluoroquinolone-resistant mutants Ryo Nishikawa, Toshiyuki Murase, and Hiroichi Ozaki.....	5900
<i>Campylobacter</i> subtypes detected in broiler ceca and livers collected at slaughter M. E. Berrang, R. J. Meinersmann, and N. A. Cox.....	5908

The composition of microbial aerosols, PM2.5, and PM10 in a duck house in Shandong province, China Bo Wu, Liwen Qin, Meng Wang, Tong Zhou, Yunxiang Dong, and Tongjie Chai.....	5913
Relation to enterocins and herbal extracts of fecal hemolytic <i>Escherichia coli</i> from domestic ducks detected with MALDI-TOF mass spectrometry J. Ščerbová, A. Kandričáková, L' Hamarová, and A. Lauková .....	5925
Efficacy of slightly acidic electrolyzed water on the microbial safety and shelf life of shelled eggs Y. T. Zang, Sh. Bing, Y. J. Li, D. Q. Shu, A. M. Huang, H. X. Wu, L. T. Lan, and H. D. Wu.....	5932
Effect of preservatives on the shelf-life and sensory characteristics of pasteurized liquid whole egg stored at 4°C Lenka Necidová, Šárka Bursová, František Ježek, Danka Haruštiaková, Lenka Vorlová, and Jozef Golian .....	5940
Evaluation of the impact of in ovo administered bacteria on microbiome of chicks through 10 days of age K. M. Wilson, D. R. Rodrigues, W. N. Briggs, A. F. Duff, K. M. Chasser, and L. R. Bielke .....	5949
<i>Salmonella</i> in native "village" chickens ( <i>Gallus domesticus</i> ): prevalence and risk factors from farms in South-Central Peninsular Malaysia Saleh Mohammed Jajere, Latiffah Hassan, Saleha Abdul Aziz, Zunita Zakaria, Jalila Abu, Fauziah Nordin, and Nik M. Faiz .....	5961
Feather analysis as a non-invasive alternative to tissue sampling for surveillance of doxycycline use on poultry farms A. Gajda, E. Nowacka-Kozak, M. Gbylik-Sikorska, and A. Posyniak .....	5971
Genetic characterization of high-level aminoglycoside-resistant <i>Enterococcus faecalis</i> and <i>Enterococcus faecium</i> isolated from retail chicken meat Yeong Bin Kim, Kwang Won Seo, Se Hyun Son, Eun Bi Noh, and Young Ju Lee .....	5981
<i>Salmonella</i> serotype assignment by sequencing analysis of intergenic regions of ribosomal RNA operons Diéssy Kipper, Rafaella Martins Hellfeldt, Silvia De Carli, Fernanda Kieling Moreira Lehmann, André Salvador Kazantzi Fonseca, Nilo Ikuta, and Vagner Ricardo Lunge.....	5989
In ovo vaccination of broilers against <i>Campylobacter jejuni</i> using a bacterin and subunit vaccine Jasmien Vandeputte, An Martel, Nathalie Van Rysselberghe, Gunther Antonissen, Marc Verlinden, Lieven De Zutter, Marc Heyndrickx, Freddy Haesebrouck, Frank Pasmans, and An Garmyn.....	5999

## MOLECULAR AND CELLULAR BIOLOGY

Candidate genes of the transcellular and paracellular calcium absorption pathways in the small intestine of laying hens A. Gloux, N. Le Roy, A. Brionne, E. Bonin, A. Juanchich, G. Benzoni, M.-L. Piketty, D. Prié, Y. Nys, J. Gautron, A. Narcy, and M. J. Duclos.....	6005
TRIM62-mediated restriction of avian leukosis virus subgroup J replication is dependent on the SPRY domain Ling Li, Weiguo Feng, Ziqiang Cheng, Jie Yang, Jianmin Bi, Xiaoman Wang, and Guihua Wang .....	6019
A cell line resistant to avian leukosis virus subgroup B infection Zi jun Zhao, Ming zhang Rao, Jian Chen, Jie Zhang, Lixia Yuan, Ming Liao, and Weisheng Cao .....	6026

## PHYSIOLOGY AND REPRODUCTION

Improvac induces immunocastration by affecting testosterone levels and disrupting spermatogenesis in male broiler chickens C. Wang, Y. T. Zeng, X. Y. Chen, Q. Y. Wu, L. Q. Yang, L. Xu, Y. Zhang, Izhar Hyder Qazi, G. B. Zhou, C.J. Zeng, Z. Z. Zuo, T. Z. Song, Q. Zhu, and M. Zhang .....	6034
--	------

Effect of guinea fowl egg storage duration on embryonic and physiological parameters, and keet juvenile growth Y. A. E. Kouame, D. Nideou, K. Kouakou, and K. Tona.....	6046
Sex differences in serum steroid hormone levels during embryonic development in hen eggs Yalan Wang, Guofeng Jin, Meihu Ma, and Xiaole Xiang.....	6053
Histological characteristics of follicles and reproductive hormone secretion during ovarian follicle development in laying geese Y. Z. Yang, Y. Yao, Z. F. Cao, T. T. Gu, Q. Xu, and G. H. Chen.....	6063
Effect of dimethylacetamide and N-methylacetamide on the quality and fertility of frozen/thawed chicken semen Fabio Mosca, Luisa Zaniboni, Ahmad Abdel Sayed, Manuela Madeddu, Nicolaia Iaffaldano, and Silvia Cerolini.....	6071
The effect of nutrient restriction and syndecan-4 or glypican-1 knockdown on the differentiation of turkey pectoralis major satellite cells differing in age and growth selection Sandra G. Velleman, Daniel L. Clark, and Jeffrey R. Tonniges.....	6078
The impact of dietary supplementation of different feed additives on performances of broiler breeders characterized by different egg-laying rate Shuju Zhao, Keying Zhang, Xuemei Ding, Pietro Celi, Lei Yan, Shiping Bai, Qiufeng Zeng, Xiangbing Mao, Shengyu Xu, and Jianping Wang.....	6091
Changes in seminal parameters and hormonal profile with use of aromatase inhibitor in management of aging broiler breeder roosters Maryam Bazyar, Mohsen Sharafi, and Abdolhossein Shahverdi.....	6100
Dietary supplementation of 25-hydroxycholecalciferol improves livability in broiler breeder hens Hsuan-Yu Lin, Thau Kiong Chung, Yu-Hui Chen, Rosemary L. Walzem, and Shuen-Ei Chen.....	6108
Profiling of RNA N6-methyladenosine methylation during follicle selection in chicken ovary Yu Fan, Chuansheng Zhang, and Guiyu Zhu.....	6117
Investigation of the relationships between different enzymes and postmortem duck muscle tenderization Jun He, Fang Deng, Daodong Pan, and Xiaoqun Zeng.....	6125

## PROCESSING AND PRODUCTS

Effect of age on calpain changes in postmortem goose muscle Ya-Shiou Chang, Marvin H. Stromer, and Rong-Ghi R. Chou.....	6131
Cellular and chemical antioxidant activities of chicken blood hydrolysates as affected by in vitro gastrointestinal digestion Ali Hamzeh, Wasana Wongngam, Ratana Kiatsongchai, and Jirawat Yongsawatdigul.....	6138
Comparison of the composition and sensory characteristics of goose fatty liver obtained by overfeeding and spontaneous fattening X. Fernandez, V. Lazzarotto, M.-D. Bernadet, and H. Manse.....	6149
The effect of raw and fermented rapeseed cake on growth performance, carcass traits, and breast meat quality in turkey A. Dražbo, K. Kozłowski, K. Ognik, A. Zaworska, and J. Jankowski.....	6161
Detection of razor shear force differences in broiler breast meat due to the woody breast condition depends on measurement technique and meat state B. Bowker and H. Zhuang.....	6170
Quality, composition, and consumer evaluation of meat from slow-growing broilers relative to commercial broilers S. K. Devatkal, B. M. Naveena, and T. Kotaiah.....	6177
Changes in the quality of eggs during storage depending on the housing system and the age of hens J. Vlčková, E. Tůmová, K. Míková, M. Englmaierová, M. Okrouhlá, and D. Chodová.....	6187
Gaping of pectoralis minor muscles: magnitude and characterization of an emerging quality issue in broilers F. Soglia, A. K. Silva, S. Tappi, L. M. Lião, P. Rocculi, L. Laghi, and M. Petracci.....	6194