DAFTAR PUSTAKA

Abdollahi, M., J. Rezaei, and H. Fazaeli. 2019. Performance, rumen fermentation, blood minerals , leukocyte and antioxidant capacity of young Holstein calves receiving high-surface ZnO instead of common ZnO. Arch Anim Nutr 00:1–17. doi:10.1080/1745039X.2019.1690389.

Abu Jamra, S.R., C.G. Komatsu, F. Barbosa, P. Roxo-Junior, and A.M. Navarro. 2023. Proposal to screen for zinc and selenium in patients with IgA deficiency. Nutrients 15:2145. doi:10.3390/nu15092145.

Abuelo, A., J. Hernández, J.L. Benedito, and C. Castillo. 2015. The importance of the oxidative status of dairy cattle in the periparturient period: Revisiting antioxidant supplementation. J Anim Physiol Anim Nutr (Berl) 99:1003–1016. doi:10.1111/jpn.12273.

Agle, M., A.N. Hristov, S. Zaman, C. Schneider, P.M. Ndegwa, and V.K. Vaddella. 2010. Effect of dietary concentrate on rumen fermentation, digestibility, and nitrogen losses in dairy cows. J Dairy Sci 93:4211–4222. doi:10.3168/jds.2009-2977.

Agus, A., A. Andriyani, and S. Bintara. 2010. Effect of supplementation of herbal-protein mix concentrate on dairy milk quality and production. Page in International Conference on Food Safety and Food Security, Yogyakarta, Indonesia.

Agus, A., A. Andriyani, and A. Munawar. 2001. The effect of cooked corn supplementation as sources of energy in the diet of lactating cows on milk yield and composition. Buletin Mediagama 3:27–36.

Agussalim, N. Umami, Nurliyani, and A. Agus. 2022. Stingless bee honey (Tetragonula laeviceps): Chemical composition and their potential roles as an immunomodulator in malnourished rats. Saudi J Biol Sci 29:103404. doi:10.1016/j.sjbs.2022.103404.

Ahsan, A.K., S.S. Tebha, R. Sangi, A. Kamran, Z.A. Zaidi, T. Haque, and M.S. Ali Hamza. 2021. Zinc micronutrient deficiency and its prevalence in malnourished pediatric children as compared to well-nourished children: A nutritional emergency. Glob Pediatr Health 8:1–6. doi:10.1177/2333794X211050316.

Alijani, K., J. Rezaei, and Y. Rouzbehan. 2020. Effect of nano-ZnO, compared to ZnO and Zn-methionine, on performance, nutrient status, rumen fermentation, blood enzymes, ferric reducing antioxidant power and immunoglobulin G in sheep. Anim Feed Sci Technol 267:114532. doi:10.1016/j.anifeedsci.2020.114532.

Alimohamady, R., H. Aliarabi, A. Bahari, and A.H. Dezfoulian. 2013. Influence of different amounts and sources of selenium supplementation on performance, some blood parameters, and nutrient digestibility in lambs. Biol Trace Elem Res 154:45–54. doi:10.1007/s12011-013-9698-4.

Alimohamady, R., H. Aliarabi, R.M. Bruckmaier, and R.G. Christensen. 2019. Effect of different sources of supplemental zinc on performance, nutrient digestibility, and antioxidant enzyme activities in lambs. Biol Trace Elem Res 189:75–84. doi:https://doi.org/10.1007/s12011-018-1448-1.

Allahyari, S., M. Chaji, and M. Mamuie. 2019. Investigation changes in production, some blood hormones, and metabolites, serum and colostrum IgG of calves of Holstein cows fed with two levels of zinc supplement in transitional period: Zinc on production, blood hormones and metabolites, serum and colostrum

IgG of calves. J Appl Anim Res 47:440–448. doi:10.1080/09712119.2019.1653301.

Allen, M.S. 2014. Drives and limits to feed intake in ruminants. Anim Prod Sci 54:1513–1524. doi:10.1071/AN14478.

AlSuwaiegh, S.B., A.M. Almotham, Y.M. Alyousef, A.T. Mansour, and A.A. Al-Sagheer. 2022. Influence of functional feed supplements on the milk production efficiency, feed utilization, blood metabolites, and health of Holstein cows during mid-lactation. Sustainability (Switzerland) 14:1–12. doi:10.3390/su14148444.

Al-Taie, Y.A.M., and M.K.K. Almahdawi. 2021. Effect of selenium and zinc doses and interaction between them on production performance and some carcass traits of Awassi lambs. Ann Rom Soc Cell Biol 25:2506–2520.

Alzahal, O., S.L. Greenwood, M.S. Douglas, and B.W. Mcbride. 2009. The effect of dietary fiber level on milk fat concentration and fatty acid profile of cows fed diets containing low levels of polyunsaturated fatty acids. J Dairy Sci 92:1108–1116. doi:10.3168/jds.2008-1472.

Andreini, C., L. Banci, I. Bertini, and A. Rosato. 2006. Zinc through the three domains of life. J Proteome Res 5:3173–3178. doi:10.1021/pr0603699.

AOAC. 2005. Official Metods of Analysis. 18th ed. Association of Official Analytical Chemists, Arlington, Washington, DC., USA.

Armstrong, D.V. 1994. Heat stress interaction with shade and cooling. J Dairy Sci 77:2044–20250.

Arshad, M.A., H.M. Ebeid, and F. ul Hassan. 2021. Revisiting the effects of different dietary sources of selenium on the health and performance of dairy animals: A review. Biol Trace Elem Res 199:3319–3337. doi:10.1007/s12011-020-02480-6.

Aschenbach, J.R., N.B. Kristensen, S.S. Donkin, H.M. Hammon, and G.B. Penner. 2010. Gluconeogenesis in dairy cows: The secret of making sweet milk from sour dough. IUBMB Life 62:869–877. doi:10.1002/iub.400.

Asmarasari, S.A., N. Azizah, S. Sutikno, W. Puastuti, A. Amir, L. Praharani, S. Rusdiana, C. Hidayat, A. Hafid, D.A. Kusumaningrum, F. Saputra, C. Talib, A. Herliatika, M.I. Shiddieqy, and S.Y. Hayanti. 2023. A review of dairy cattle heat stress mitigation in Indonesia. Vet World 16:1098–1108. doi:10.14202/vetworld.2023.1098-1108.

Astuti, A., Adiarto, and A. Agus. 2016. Dairy cattle in Indonesia: Challenges and opportunities. Pages 1–10 in Workshop of 17th AAAP Animal Science Congress.

Astuti, A., A. Agus, S. Priyono, and S. Budhi. 2009. The effect of high quality feed supplement addition on the nutrient consumption and digestibility of early lactating dairy cow. Buletin Peternakan 33:81–87.

Astuti, A., Rochijan, B. Prasetyo Widyobroto, and C. Tri Noviandi. 2022. Nutrient status, hematological and blood metabolite profile of mid-lactating dairy cows during wet and dry seasons raised under Indo tropical environmental conditions. Journal of Animal Behaviour and Biometeorology 10. doi:10.31893/jabb.22007.

Avci, G.U., B.B. Kanat, G. Can, D.S. Erdincler, A. Doventas, and H. Yavuzer. 2023. The relationship between malnutrition and neutrophil–to-lymphocyte ratio in hospitalized older patients. Bratislava Medical Journal 124:498–502. doi:10.4149/BLL_2023_076.

Avery, J.C., and P.R. Hoffmann. 2018. Selenium, selenoproteins, and immunity. Nutrients 10. doi:10.3390/nu10091203.

Azis, I.U., A. Agus, A. Astuti, L.M. Yusiati, and M.A. Anas. 2023. Effect of mineral premix supplementation on intake and digestibility of repeat breeder cows. Page in IOP Conference Series: Earth and Environmental Science. Institute of Physics.

Azorin, I., J. Madrid, S. Mart, L. Marina, M. Jos, and F. Hern. 2020. Can Moderate Levels of Organic Selenium in Dairy Cow Feed Naturally Enrich Dairy Products ?. Animals 10:1–17.

Azorín, I., J. Madrid, S. Martínez-Miró, M. López, M.B. López, M.J. López, and F. Hernández. 2024. Combined supplementation of two selenium forms (organic and inorganic) and iodine in dairy cows' diet to obtain enriched milk, cheese, and yogurt. Animals 14:1373. doi:10.3390/ani14091373.

Badan Kebijakan Pembangunan Kesehatan Kemenkes RI. 2022. Buku Saku Hasil Survei Status Gizi Indonesia (SSGI) 2022. Badan Kebijakan Pembangunan Kesehatan, Kementerian Kesehatan Republik Indonesia, Jakarta.

Bahrami-Yekdangi, H., M. Khorvash, G.R. Ghorbani, M. Alikhani, R. Jahanian, and E. Kamalian. 2014. Effects of decreasing metabolizable protein and rumen-undegradable protein on milk production and composition and blood metabolites of Holstein dairy cows in early lactation. J Dairy Sci 97:3707–3714. doi:10.3168/jds.2013-6725.

Bahtta, R., M. Saravanan, L. Baruah, and K.T. Sampath. 2012. Nutrient content, in vitro ruminal fermentation characteristics and methane reduction potential of tropical tannin-containing leaves. J Sci Food Agric 92:2929–2935. doi:10.1002/jsfa.5703.

Bakhshizadeh, S., F.M. Aghjehgheshlagh, A. Taghizadeh, J. Seifdavati, and B. Navidshad. 2019. Effect of zinc sources on milk yield, milk composition and plasma concentration of metabolites in dairy cows. S Afr J Anim Sci 49:884–891. doi:10.4314/SAJAS.V49I5.11.

Baldwin, A.L., and E.B. Wiley. 2002. Selenium reduces hemoglobin-induced epithelial damage to intestinal mucosa. Artif Cells Blood Substit Immobil Biotechnol 30:1–22. doi:10.1081/BIO-120002724.

Barchielli, G., A. Capperucci, and D. Tanini. 2022. The role of selenium in pathologies: An updated review. Antioxidants 11:251. doi:10.3390/antiox11020251.

Bargo, F., L.D. Muller, E.S. Kolver, and J.E. Delahoy. 2003. Invited review: Production and digestion of supplemented dairy cows on pasture. J Dairy Sci 86:1–42. doi:10.3168/jds.S0022-0302(03)73581-4.

Betancur-Murillo, C.L., S.B. Aguilar-Marín, and J. Jovel. 2023. Prevotella: A key player in ruminal metabolism. Microorganisms 11:1–18. doi:10.3390/microorganisms11010001.

Białek, M., and M. Czauderna. 2019. Composition of rumen-surrounding fat and fatty acid profile in selected tissues of lambs fed diets supplemented with fish and rapeseed oils, carnosic acid, and different chemical forms of selenium. Livest Sci 226:122–132. doi:10.1016/j.livsci.2019.06.013.

Bierla, K., M. Dernovics, V. Vacchina, J. Szpunar, G. Bertin, and R. Lobinski. 2008. Determination of selenocysteine and selenomethionine in edible animal tissues by 2D size-exclusion reversed-phase HPLC-ICP MS following carbamidomethylation and proteolytic extraction. Anal Bioanal Chem 390:1789–1798. doi:10.1007/s00216-008-1883-5.

Bionaz, M., W. Hurley, and J. Loor. 2012. Milk Protein Synthesis in the Lactating Mammary Gland: Insights from Transcriptomics Analyses. W.L. Hurley, ed. IntechOpen, Rijeka.

Biscarini, F., F. Palazzo, F. Castellani, G. Masetti, L. Grotta, A. Cichelli, and G. Martino. 2018. Rumen microbiome in dairy calves fed copper and grape-pomace dietary supplementations: Composition and predicted functional profile. PLoS One 13:1–20. doi:10.1371/journal.pone.0205670.

Bogale, T.Y., E.T. Bala, M. Tadesse, and B.O. Asamoah. 2018. Prevalence and associated factors for stunting among 6-12 years old school age children from rural community of Humbo district, Southern Ethiopia. BMC Public Health 18. doi:10.1186/s12889-018-5561-z.

Bohmanova, J., I. Misztal, and J.B. Cole. 2007. Temperature-humidity indices as indicators of milk production losses due to heat stress. J Dairy Sci 90:1947–1956. doi:10.3168/jds.2006-513.

Bolyen, E., J.R. Rideout, M.R. Dillon, N.A. Bokulich, C.C. Abnet, G.A. Al-Ghalith, and *et al*. 2019. Reproducible, interactive, scalable and extensible microbiome data science using QIIME 2. Nat Biotechnol 37:852–857. doi:10.1038/s41587-019-0209-9.

Bonetti, A., B. Tugnoli, A. Piva, and E. Grilli. 2021. Towards zero zinc oxide: Feeding strategies to manage post-weaning diarrhea in piglets. Animals 11:1–24. doi:10.3390/ani11030642.

Bouis, H.E., and A. Saltzman. 2017. Improving nutrition through bioforti fi cation : A review of evidence from HarvestPlus, 2003 through 2016. Glob Food Sec 12:49–58. doi:10.1016/j.gfs.2017.01.009.

BPS. 2024a. Populasi Sapi Perah menurut Provinsi (Ekor), 2021-2023.

BPS. 2024b. Produksi Susu Segar Menurut Provinsi (Ton), 2021-2023. Accessed.

Brady, E.L., K.M. Pierce, M.B. Lynch, A.G. Fahey, and F.J. Mulligan. 2021. The effect of nutritional management in early lactation and dairy cow genotype on milk production, metabolic status, and uterine recovery in a pasture-based system. J Dairy Sci 104:5522–5538. doi:10.3168/jds.2020-19329.

Broderick, G.A. 2003. Effects of varying dietary protein and energy levels on the production of lactating dairy cows. J Dairy Sci 86:1370–1381. doi:10.3168/jds.S0022-0302(03)73721-7.

Broome, C.S., F. Mcardle, J.A. Kyle, F. Andrews, N.M. Lowe, A. Hart, J.R. Arthur, and M.J. Jackson. 2004. An increase in selenium intake improves immune function and poliovirus handling in adults with marginal selenium status 1-3. Am J Clin Nutr 80:154–62.

Broome, C.S., F. Mcardle, J.A.M. Kyle, F. Andrews, N.M. Lowe, C.A. Hart, J.R. Arthur, and M.J. Jackson. 2018. An increase in selenium intake improves immune function and poliovirus handling in adults with marginal selenium status 1 – 3 154–162.

Brown, E.M., M. Wlodarska, B.P. Willing, P. Vonaesch, J. Han, L.A. Reynolds, M.C. Arrieta, M. Uhrig, R. Scholz, O. Partida, C.H. Borchers, P.J. Sansonetti, and B.B. Finlay. 2015. Diet and specific microbial exposure trigger features of environmental enteropathy in a novel murine model. Nat Commun 6:1–16. doi:10.1038/ncomms8806.

Bruckental, I., S. Abramson, S. Zamwell, G. Adin, and A. Arieli. 2002. Effects of dietary undegradable crude protein level on total non-structural carbohydrate (TNC) digestibility, and milk yield and composition of dairy cows.

Bugoni, M., C.S. Takiya, N.T.S. Grigoletto, P.C. Vittorazzi Júnior, A.T. Nunes, R.G. Chesini, G.G. da Silva, T. Durman, J.E. Pettigrew, and F.P. Rennó. 2023. Feeding amylolytic and proteolytic exogenous enzymes: Effects on nutrient digestibility, ruminal fermentation, and performance in dairy cows. J Dairy Sci 106:3192–3202. doi:10.3168/jds.2022-22610.

Burk, R.F., and K.E. Hill. 2015. Regulation of selenium metabolism and transport. Annu Rev Nutr 35:109–134. doi:10.1146/annurev-nutr-071714-034250.

Burk, R.F., K.E. Hill, and A.K. Motley. 2003. Selenoprotein metabolism and function: Evidence for more than one function for selenoprotein P. Journal of Nutrition 133:1517–1520. doi:10.1093/jn/133.5.1517s.

Butler, A. 1998. Acquisition and utilization of transition metal ions by marine organisms. Chemistry and Biology of the Oceans 281:207–210.

Cai, X., Z. Hu, M. Zhang, Q. Dang, Q. Yang, X. Zhao, Y. Zhu, Y. Zhang, Y. Wei, H. Fang, and H. Yu. 2024. Dosage-effect of selenium supplementation on blood glucose and oxidative stress in type 2 diabetes mellitus and normal mice. Journal of Trace Elements in Medicine and Biology 83. doi:10.1016/j.jtemb.2024.127410.

Caixeta, L.S., and B.O. Omontese. 2021. Monitoring and improving the metabolic health of dairy cows during the transition period. Animals 11:1–17. doi:10.3390/ani11020352.

Calamari, L., F. Petrera, and G. Bertin. 2010. Effects of either sodium selenite or Se yeast (Sc CNCM I-3060) supplementation on selenium status and milk characteristics in dairy cows. Livest Sci 128:154–165. doi:10.1016/j.livsci.2009.12.005.

Callahan, B.J., P.J. McMurdie, M.J. Rosen, A.W. Han, A.J.A. Johnson, and S.P. Holmes. 2016. DADA2: High-resolution sample inference from Illumina amplicon data. Nat Methods 13:581–583. doi:10.1038/nmeth.3869.

Cammack, K.M., K.J. Austin, W.R. Lamberson, G.C. Conant, and H.C. Cunningham. 2018. Ruminnat nutrition symposium: Tiny but mighty: The role of the rumen microbes in livestock production. J Anim Sci 96:752–770. doi:10.1093/jas/skx053.

Cano, P.G., G. Agüero, and G. Perdigón. 2002. Immunological effects of yogurt addition to a re-nutrition diet in a malnutrition experimental model. Journal of Dairy Research 69:303–316. doi:10.1017/S0022029902005411.

Castillo-González, A.R., M.E. Burrola-Barraza, J. Domínguez-Viveros, and A. Chávez-Martínez. 2014. Rumen microorganisms and fermentation. Arch Med Vet 46:349–361. doi:10.4067/S0301-732X2014000300003.

Ceballos, A., J. Sánchez, H. Stryhn, J.B. Montgomery, H.W. Barkema, and J.J. Wichtel. 2009. Meta-analysis of the effect of oral selenium supplementation on milk selenium concentration in cattle. J Dairy Sci 92:324–342. doi:10.3168/jds.2008-1545.

Cesta, M.F. 2006. Normal structure, function, and histology of the spleen. Toxicol Pathol 34:455–465. doi:10.1080/01926230600867743.

Chandra, G., A. Aggarwal, A.K. Singh, and M. Kumar. 2014. Effect of vitamin E and zinc supplementation on liver enzymatic profile of pre- And post-partum Sahiwal cows. Indian Journal of Animal Sciences 84:507–510. doi:10.56093/ijans.v84i5.40650.

Chandra, G., A. Aggarwal, A.K. Singh, M. Kumar, and R.C. Upadhyay. 2013. Effect of vitamin E and zinc supplementation on energy metabolites, lipid

peroxidation, and milk production in peripartum sahiwal cows. Asian-Australas J Anim Sci 26:1569–1576. doi:10.5713/ajas.2012.12682.

Chanthakhoun, V., M. Wanapat, and J. Berg. 2012. Level of crude protein in concentrate supplements influenced rumen characteristics, microbial protein synthesis and digestibility in swamp buffaloes (Bubalus bubalis). Livest Sci 144:197–204. doi:10.1016/j.livsci.2011.11.011.

Chao, Y., B. Yu, J. He, Z. Huang, X. Mao, J. Luo, Y. Luo, P. Zheng, J. Yu, and D. Chen. 2019. Archives of Animal Nutrition Effects of different levels of dietary hydroxy- analogue of selenomethionine on growth performance , selenium deposition and antioxidant status of weaned piglets. Arch Anim Nutr 00:1–10. doi:10.1080/1745039X.2019.1641368.

Chassard, C., E. Delmas, C. Robert, P.A. Lawson, and A. Bernalier-Donadille. 2011. Ruminococcus champanellensis sp. nov., a cellulose-degrading bacterium from human gut microbiota. Int J Syst Evol Microbiol 62:138–143. doi:10.1099/ijs.0.027375-0.

Chen, F., Y. Li, Y. Shen, Y. Guo, X. Zhao, Q. Li, Y. Cao, X. Zhang, Y. Li, Z. Wang, Y. Gao, and J. Li. 2020a. Effects of prepartum zinc-methionine supplementation on feed digestibility, rumen fermentation patterns, immunity status, and passive transfer of immunity in dairy cows. J Dairy Sci 103:8976–8985. doi:10.3168/jds.2019-17991.

Chen, H., C. Wang, S. Huasai, and A. Chen. 2021a. Effects of dietary forage to concentrate ratio on nutrient digestibility, ruminal fermentation and rumen bacterial composition in Angus cows. Sci Rep 11:1–11. doi:10.1038/s41598-021-96580-5.

Chen, H., C. Wang, S. Huasai, and A. Chen. 2021b. Dietary concentrate supplementation alters serum metabolic profiles related to energy and amino acid metabolism in grazing Simmental heifers. Front Vet Sci 8:743410. doi:10.3389/fvets.2021.743410.

Chen, J., O.M. Harstad, T. McAllister, P. Dörsch, and H. Holo. 2020b. Propionic acid bacteria enhance ruminal feed degradation and reduce methane production in vitro. Acta Agriculturae Scandinavica A: Animal Sciences 69:169–175. doi:10.1080/09064702.2020.1737215.

Chen, M., Y. Xi, L. Zhang, H. Zeng, Y. Li, and Z. Han. 2019. Effects of zinc-bearing palygorskite on rumen fermentation in vitro. Asian-Australas J Anim Sci 32:63–71. doi:https://doi.org/10.5713/ajas.17.0920.

Chen, X.B., and M.J. Gomes. 1995. Estimation of microbial protein supply to sheep and cattle based on urinary excretion of purine derivatives-An overview of technical details. Bucksburn Aberdeen AB2 9SB, UK .

Cheng, K.F., C. Wang, G.W. Zhang, H.S. Du, Z.Z. Wu, Q. Liu, G. Guo, W.J. Huo, J. Zhang, L. Chen, and C.X. Pei. 2020. Effects of betaine and rumen-protected folic acid supplementation on lactation performance, nutrient digestion, rumen fermentation and blood metabolites in dairy cows. Anim Feed Sci Technol 262:1–9. doi:10.1016/j.anifeedsci.2020.114445.

Chong, J., P. Liu, G. Zhou, and J. Xia. 2020. Using MicrobiomeAnalyst for comprehensive statistical, functional, and meta-analysis of microbiome data. Nat Protoc 15:799–821. doi:10.1038/s41596-019-0264-1.

Christensen, B., T.F. Krüger, T.P. Hjorth, E.H. Buhl, and E.S. Sørensen. 2025. Milk osteopontin mediates zinc uptake in intestinal cells in the presence of phytic acid. Int Dairy J 161:106113. doi:10.1016/j.idairyj.2024.106113.

Clemmons, B.A., B.H. Voy, and P.R. Myer. 2019. Altering the gut microbiome of cattle: Considerations of host-microbiome interactions for persistent microbiome manipulation. Microb Ecol 77:523–536. doi:10.1007/s00248-018-1234-9.

Čobanova, K., Š. Faix, I. Plachá, K. Mihaliková, Z. Váradyová, S. Kišidayová, and L. Grešáková. 2017. Effects of different dietary selenium sources on antioxidant status and blood phagocytic activity in sheep. Biol Trace Elem Res 175:339–346. doi:10.1007/s12011-016-0794-0.

Cobo-Angel, C., J. Wichtel, and A. Ceballos-Márquez. 2014. Selenium in milk and human health. Animal Frontiers 4:38–43. doi:10.2527/af.2012-0013.

Colmenero, J.J.O., and G.A. Broderick. 2006. Effect of dietary crude protein concentration on milk productivity traits in early lactation dairy cows. J Dairy Sci 89:1704–1712. doi:https://doi.org/10.3168/jds.S0022-0302(06)72238-X.

Comerford, K.B., G.D. Miller, A.C. Boileau, S.N.M. Schuette, J.C. Giddens, and K.A. Brown. 2021. Global Review of Dairy Recommendations in Food-Based Dietary Guidelines. Front Nutr 8:1–10. doi:10.3389/fnut.2021.671999.

Cone, J.W., and P.M. Becker. 2012. Fermentation kinetics and production of volatile fatty acids and microbial protein by starchy feedstuffs. Anim Feed Sci Technol 172:34–41. doi:10.1016/j.anifeedsci.2011.12.006.

Contreras, G.A., and L.M. Sordillo. 2011. Lipid mobilization and inflammatory responses during the transition period of dairy cows. Comp Immunol Microbiol Infect Dis 34:281–289. doi:10.1016/j.cimid.2011.01.004.

Cope, C.M., A.M. MacKenzie, D. Wilde, and L.A. Sinclair. 2009. Effects of level and form of dietary zinc on dairy cow performance and health. J Dairy Sci 92:2128–2135. doi:10.3168/jds.2008-1232.

Cortés-Barberena, E., H. González-Márquez, J.L. Gómez-Olivares, and R. Ortiz-Muñiz. 2008. Effects of moderate and severe malnutrition in rats on splenic T lymphocyte subsets and activation assessed by flow cytometry. Clin Exp Immunol 152:585–592. doi:10.1111/j.1365-2249.2008.03649.x.

Cortinhas, C.S., J.E. de F. Júnior, J. de R. Naves, M.A. de F. Porcionato, L.F.P. Silva, F.P. Rennó, and M.V. dos Santos. 2012. Organic and inorganic sources of zinc, copper and selenium in diets for dairy cows: intake, blood metabolic profile, milk yield and composition. Revista Brasileira de Zootecnia 41:1477–1483.

Cozzi, G., L. Ravarotto, F. Gottardo, A.L. Stefani, B. Contiero, L. Moro, M. Brscic, and P. Dalvit. 2011. Short communication: Reference values for blood parameters in Holstein dairy cows: Effects of parity, stage of lactation, and season of production. J Dairy Sci 94:3895–3901. doi:10.3168/jds.2010-3687.

Cruickshank, K.M., B. Hatew, A.M. Gehman, K.M. Koenig, E.S. Ribeiro, B.W. McBride, and M.A. Steele. 2024. The effect of supplementary selenium source on apparent and true absorption, retention, performance, and selenium status in lactating Holstein cows. J Dairy Sci 107:6211–6224. doi:10.3168/jds.2023-24283.

Cruz, V.C., and I.B. Fernandez. 2011. Effect of organic selenium and zinc on the performance and egg quality of japanese quails. Brazilian Journal of Poultry Science 13:91–95.

Cui, X., Z. Wang, Y. Tan, S. Chang, H. Zheng, H. Wang, T. Yan, T. Guru, and F. Hou. 2021. Selenium yeast dietary supplement affects rumen bacterial population dynamics and fermentation parameters of Tibetan sheep (Ovis

aries) in Alpine Meadow. Front Microbiol 12:1–14. doi:10.3389/fmicb.2021.663945.

Dai, Q., J. Ma, G. Cao, R. Hu, Y. Zhu, G. Li, H. Zou, Z. Wang, Q. Peng, B. Xue, and L. Wang. 2021. Comparative study of growth performance, nutrient digestibility, and ruminal and fecal bacterial community between yaks and cattle-yaks raised by stall-feeding. AMB Express 11. doi:10.1186/s13568-021-01259-9.

Dai, X., Y. Tian, J. Li, X. Su, X. Wang, S. Zhao, L. Liu, Y. Luo, D. Liu, H. Zheng, J. Wang, Z. Dong, S. Hu, and L. Huang. 2015. Metatranscriptomic analyses of plant cell wall polysaccharide degradation by microorganisms in the cow rumen. Appl Environ Microbiol 81:1375–1386. doi:10.1128/AEM.03682-14.

Dalia, A.M., T.C. Loh, A.Q. Sazili, and A.A. Samsudin. 2020. Influence of bacterial organic selenium on blood parameters, immune response, selenium retention and intestinal morphology of broiler chickens. BMC Vet Res 16. doi:10.1186/s12917-020-02587-x.

Danes, M.A.C., M.D. Hanigan, S.I. Arriola Apelo, J.D.L. Dias, M.A. Wattiaux, and G.A. Broderick. 2020. Post-ruminal supplies of glucose and casein, but not acetate, stimulate milk protein synthesis in dairy cows through differential effects on mammary metabolism. J Dairy Sci 103:6218–6232. doi:10.3168/jds.2019-18086.

Danesh Mesgaran, M., H. Kargar, R. Janssen, S. Danesh Mesgaran, A. Ghesmati, and A. Vatankhah. 2022. Rumen-protected zinc–methionine dietary inclusion alters dairy cow performances, and oxidative and inflammatory status under long-term environmental heat stress. Front Vet Sci 9. doi:10.3389/fvets.2022.935939.

Danfaer, A. 1994. Nutrient metabolism and utilization in the liver. Livest Prod Sci 39:115–127.

Dargatz, D.A., and P.F. Ross. 1996. Blood Selenium Concentrations in Cows and Heifers on 253 Cow-Calf Operations in 18 States. J Anim Sci 74:2891–2895. doi:10.2527/1996.74122891x.

Dehghani, F., S.A. Hossieni, A. Noorafshan, M.R. Panjehshahin, and T. Esmaeilpour. 2021. Effect of selenium on quantitative structural changes in dexamethasone-induced immunodeficiency rat models. Iran J Med Sci 46:128–135. doi:10.30476/ijms.2020.81137.0.

Dehghani, S., A. Taghizadeh, and H. Mohammadzadeh. 2019. The effects of different forms of selenium on gas production parameters, rumen fermentation and rumen protozoa population. Iranian Journal of Animal Science Research 11:307–317. doi:10.22067/ijasr.

Delves, P.J., and I.M. Roitt. 2000. The immune system. Adv Immunol 343:37–49. doi:10.1056/nejm200007063430107.

Despal, C. Faresty, R. Zahera, and T. Toharmat. 2022. The feeding behavior of dairy cattle under tropical heat stress conditions at smallholder urban farming. Biodiversitas 23:3771–3777. doi:10.13057/biodiv/d230753.

Dhanjal, N.I. kaur, S. Sharma, K.S. Prabhu, and N. Tejo Prakash. 2017. Selenium supplementation through Se-rich dietary matrices can upregulate the anti-inflammatory responses in lipopolysaccharide-stimulated murine macrophages. Food Agric Immunol 28:1374–1392. doi:10.1080/09540105.2017.1343805.

Dida, M.F., S.C. Garcia, and L.A. Gonzalez. 2024. Dietary concentrate supplementation increases milk production and reduces predicted

greenhouse gas emission intensity in pasture-based commercial dairy farms. J Dairy Sci 107:5639–5652. doi:10.3168/jds.2023-24303.

Dijkstra, J., and S. Tamminga. 1995. Simulation of the effects of diet on the contribution of rumen protozoa to degradation of fibre in the rumen. British Journal of Nutrition 74:617–634. doi:10.1079/bjn19950166.

dos-Santos, M., R. Rosa, R. Curi, and D. Barbieri. 1997. Effect of protein malnutrition on the glycolytic and glutaminolytic enzyme activity of rat thymus and mesenteric lymph nodes. Braz J Med Biol Res 30:719–722.

Dresler, S., J. Illek, K. Cebulska, and M. Šoch. 2023. Effect of organic zinc supplementation on hematological, mineral, and metabolic profile in dairy cows in early lactation. Pol J Vet Sci 26:675–686. doi:10.24425/pjvs.2023.148287.

Du, H.S., C. Wang, Z.Z. Wu, G.W. Zhang, Q. Liu, G. Guo, W.J. Huo, Y.L. Zhang, C.X. Pei, and S.L. Zhang. 2019. Effects of rumen-protected folic acid and rumen-protected sodium selenite supplementation on lactation performance, nutrient digestion, ruminal fermentation and blood metabolites in dairy cows. J Sci Food Agric 99:5826–5833. doi:10.1002/jsfa.9853.

Durand, M., and R. Kawashima. 1980. Influence of minerals in rumen microbial digestion. Digestive Physiology and Metabolism in Ruminants 375–408. doi:10.1007/978-94-011-8067-2_18.

Eberly, J.O., S.A. Wyffels, T.J. Carlisle, and T. DelCurto. 2023. Rumen microbiome response to sustained release mineral bolus supplement with low- and high-quality forages. Frontiers in Animal Science 4:1188874. doi:10.3389/fanim.2023.1188874.

EFSA Panel on Dietetic Products, N. and A. (NDA). 2014a. Scientific opinion on dietary reference values for selenium. EFSA Journal 12:3846. doi:10.2903/j.efsa.2014.3846.

EFSA Panel on Dietetic Products, N. and A. (NDA). 2014b. Scientific opinion on dietary reference values for zinc. EFSA Journal 12:3844. doi:10.2903/j.efsa.2014.3844.

Ehrenstein, M.R., and C.A. Notley. 2010. The importance of natural IgM: Scavenger, protector and regulator. Nat Rev Immunol 10:778–786. doi:10.1038/nri2849.

Ellis, R.G., T.H. Herdt, and H.D. Stowe. 1997. Physical, hematologic, biochemical, and immunologic effects of supranutritional supplementation with dietary selenium in Holstein cows. Am J Vet Res 58:760–764.

Esposito, G., P.C. Irons, E.C. Webb, and A. Chapwanya. 2014. Interactions between negative energy balance, metabolic diseases, uterine health and immune response in transition dairy cows. Anim Reprod Sci 144:60–71. doi:10.1016/j.anireprosci.2013.11.007.

Estrela, D.C., C.G.C. Lemes, A.T.B. Guimarães, and G. Malafaia. 2014. Effects of short-term malnutrition in rats. Scientia Plena 10:1–13.

Faciola, A.P., and G.A. Broderick. 2014. Effects of feeding lauric acid or coconut oil on ruminal protozoa numbers, fermentation pattern, digestion, omasal nutrient flow, and milk production in dairy cows. J Dairy Sci 97:5088–5100. doi:10.3168/jds.2013-7653.

Fagari-Nobijari, H., H. Amanlou, and M. Dehghan-Banadaky. 2012. Effects of zinc supplementation on growth performance, blood metabolites and lameness in young Holstein bulls. J Appl Anim Res 40:222–228. doi:10.1080/09712119.2012.662776.

Fan, Q., M. Wanapat, T. Yan, and F. Hou. 2020. Altitude influences microbial diversity and herbage fermentation in the rumen of yaks. BMC Microbiol 20:1–13. doi:10.1186/s12866-020-02054-5.

Fantuz, F., S. Ferraro, L. Todini, R. Spurio, A. Fatica, F. Marcantoni, and E. Salimei. 2022. Distribution of selected trace elements in the major fractions of donkey milk. J Dairy Sci 105:6422–6430. doi:10.3168/jds.2022-21901.

Fatmi, W., Z. Kechrid, M. Nazıroğlu, and M. Flores-Arce. 2013. Selenium supplementation modulates zinc levels and antioxidant values in blood and tissues of diabetic rats fed zinc-deficient diet. Biol Trace Elem Res 152:243–250. doi:10.1007/s12011-013-9613-z.

Faulkner, M.J., and J.D. Helmann. 2011. Peroxide stress elicits adaptive changes in bacterial metal ion homeostasis. Antioxid Redox Signal 15:175–189.

Faulkner, M.J., B.A. Wenner, L.M. Solden, and W.P. Weiss. 2017. Source of supplemental dietary copper, zinc, and manganese affects fecal microbial relative abundance in lactating dairy cows. J Dairy Sci 100:1037–1044. doi:10.3168/jds.2016-11680.

Fellner, V., S. Durosoy, V. Kromm, and J.W. Spears. 2021. Effects of supplemental zinc on ruminal fermentation in continuous cultures*. Applied Animal Science 37:27–32. doi:10.15232/aas.2020-02104.

Ferreira-Paes, T., P. Seixas-Costa, and E.E. Almeida-Amaral. 2021. Validation of a feed protocol in a mouse model that mimics marasmic malnutrition. Front Vet Sci 8:757136. doi:10.3389/fvets.2021.757136.

Ferris, C.P., F.J. Gordon, D.C. Patterson, C.S. Mayne, and M.A. McCoy. 2003. A short-term comparison of the performance of four grassland-based systems of milk production for autumn-calving dairy cows. Grass and Forage Science 58:192–209. doi:10.1046/j.1365-2494.2003.00371.x.

Ferris, C.P., D.C. Patterson, M.A. McCoy, and D.J. Kilpatrick. 2010. Effect of offering dairy cows diets differing in phosphorus concentration over four successive lactations: 1. Food intake, milk production, tissue changes and blood metabolites. Animal 4:545–559. doi:10.1017/S1751731109990929.

Filípek, J., and R. Dvořák. 2009. Determination of the volatile fatty acid content in the rumen liquid : Comparison of gas chromatography and capillary isotachophoresis. Acta Veterinaria Brno 78:627–633. doi:10.2754/avb200978040627.

Firkins, J.L., Z. Yu, and M. Morrison. 2007. Ruminal nitrogen metabolism: Perspectives for integration of microbiology and nutrition for dairy. J Dairy Sci 90:E1–E16. doi:10.3168/jds.2006-518.

Fisher, G.E. 2008. Micronutrients and animal nutrition and the link between the application of micronutrients to crops and animal health. Turkish Journal of Agriculture and Forestry 32:221–233. doi:10.3906/tar-0802-40.

Gading, B.M.W.T., P. Panjono, and A. Agus. 2019. The effect of high quality feed supplement on growth performance post-weaning calves. Buletin Peternakan 43:97–102. doi:10.21059/buletinpeternak.v43i2.38905.

Gao, S., H. Hong, C. Zhang, K. Wang, B. Zhang, Q. an Han, H. Liu, and Y. Luo. 2019. Immunomodulatory effects of collagen hydrolysates from yak (Bos grunniens) bone on cyclophosphamide-induced immunosuppression in BALB/c mice. J Funct Foods 60. doi:10.1016/j.jff.2019.103420.

Gao, X., Z. Zhang, Y. Li, X. Hu, P. Shen, Y. Fu, Y. Cao, and N. Zhang. 2016. Selenium deficiency deteriorate the inflammation of s. aureus infection via

regulating NF-κB and PPAR-γ in mammary gland of mice. Biol Trace Elem Res 172:140–147. doi:10.1007/s12011-015-0563-5.

Garg, A.K., V. Mudgal, and R.S. Dass. 2008. Effect of organic zinc supplementation on growth, nutrient utilization and mineral profile in lambs. Anim Feed Sci Technol 144:82–96. doi:10.1016/j.anifeedsci.2007.10.003.

Gashu, D., B.J. Stoecker, K. Bougma, A. Adish, G.D. Haki, and G.S. Marquis. 2016. Stunting, selenium deficiency and anemia are associated with poor cognitive performance in preschool children from rural Ethiopia. Nutr J 15:1–8. doi:10.1186/s12937-016-0155-z.

Ge, T., C. Yang, B. Li, X. Huang, L. Zhao, X. Zhang, L. Tian, and E. Zhang. 2023. High-energy diet modify rumen microbial composition and microbial energy metabolism pattern in fattening sheep. BMC Vet Res 19:1–12. doi:10.1186/s12917-023-03592-6.

Ghazi, S., A.M. Diab, M.M. Khalafalla, and R.A. Mohamed. 2022. Synergistic Effects of Selenium and Zinc Oxide Nanoparticles on Growth Performance, Hemato-biochemical Profile, Immune and Oxidative Stress Responses, and Intestinal Morphometry of Nile Tilapia (Oreochromis niloticus). Biol Trace Elem Res 200:364–374. doi:10.1007/s12011-021-02631-3.

Ghorbani, A., M.M. Moeini, M. Souri, and H. Hajarian. 2018. Influences of dietary selenium, zinc and their combination on semen characteristics and testosterone concentration in mature rams during breeding season. J Appl Anim Res 46:813–819. doi:10.1080/09712119.2017.1406858.

Ghorbani, A., M.M. Moeini, M. Souri, H. Hajarian, and R. Kachuee. 2024. Effect of dietary zinc, selenium and their combination on antioxidant parameters in serum and Semen of Sanjabi mature rams. Journal of Trace Elements and Minerals 8:100118. doi:10.1016/j.jtemin.2024.100118.

Gilmore, H.S., F.J. Young, D.C. Patterson, A.R.G. Wylie, R.A. Law, D.J. Kilpatrick, C.T. Elliott, and C.S. Mayne. 2011. An evaluation of the effect of altering nutrition and nutritional strategies in early lactation on reproductive performance and estrous behavior of high-yielding Holstein-Friesian dairy cows. J Dairy Sci 94:3510–3526. doi:10.3168/jds.2010-3547.

Gleason, C.B., L.M. Beckett, and R.R. White. 2022. Rumen fermentation and epithelial gene expression responses to diet ingredients designed to differ in ruminally degradable protein and fiber supplies. Sci Rep 12:1–11. doi:10.1038/s41598-022-06890-5.

Gleghorn, J.F., N.A. Elam, M.L. Galyean, G.C. Duff, N.A. Cole, and J.D. Rivera. 2004. Effects of crude protein concentration and degradability on performance, carcass characteristics, and serum urea nitrogen concentrations in finishing beef steers. J Anim Sci 82:2705–2717.

Goff, J.P. 2018. Invited review: Mineral absorption mechanisms, mineral interactions that affect acid–base and antioxidant status, and diet considerations to improve mineral status. J Dairy Sci 101:2763–2813. doi:10.3168/jds.2017-13112.

Gombart, A.F., A. Pierre, and S. Maggini. 2020. A review of micronutrients and the immune system–working in harmony to reduce the risk of infection. Nutrients 12:236. doi:10.3390/nu12010236.

Gong, J., L. Ni, D. Wang, B. Shi, and S. Yan. 2014. Effect of dietary organic selenium on milk selenium concentration and antioxidant and immune status in midlactation dairy cows. Livest Sci 170:84–90. doi:10.1016/j.livsci.2014.10.003.

Gong, J., and M. Xiao. 2016. Selenium and antioxidant status in dairy cows at different stages of lactation. Biol Trace Elem Res 171:89–93. doi:10.1007/s12011-015-0513-2.

Gong, J., and M. Xiao. 2018. Effect of organic selenium supplementation on selenium status, oxidative stress, and antioxidant status in selenium-adequate dairy cows during the periparturient period. Biol Trace Elem Res 186:430–440. doi:10.1007/s12011-018-1323-0.

Gonzalez, M.R., V. Ducret, S. Leoni, and K. Perron. 2019. Pseudomonas aeruginosa zinc homeostasis: Key issues for an opportunistic pathogen. Biochim Biophys Acta Gene Regul Mech 1862:722–733. doi:10.1016/j.bbagrm.2018.01.018.

Gordon, F.J., C.P. Ferris, D.C. Patterson, and C.S. Mayne. 2000. A comparison of two grassland-based systems for autumn-calving dairy cows of high genetic merit. Grass and Forage Science 55:83–96. doi:10.1046/j.1365-2494.2000.00202.x.

Gorewit, R.C. 1988. Lactation Biology and Methods of Increasing Efficiency. National Academy Press.

Graham, T.W. 1991. Trace Element Deficiencies in Cattle. Veterinary Clinics of North America: Food Animal Practice 7:153–215. doi:10.1016/S0749-0720(15)30816-1.

Greenough, M.A., I. Volitakis, Q.X. Li, K. Laughton, G. Evin, M. Ho, A.H. Dalziel, J. Camakaris, and A.I. Bush. 2011. Presenilins promote the cellular uptake of copper and zinc and maintain copper chaperone of SOD1-dependent copper/zinc superoxide dismutase activity. Journal of Biological Chemistry 286:9776–9786. doi:10.1074/jbc.M110.163964.

Grešáková, Ľ., M. Holodová, M. Szumacher-Strabel, H. Huang, P. Ślósarz, J. Wojtczak, N. Sowińska, and A. Cieślak. 2021. Mineral status and enteric methane production in dairy cows during different stages of lactation. BMC Vet Res 17:1–9. doi:10.1186/s12917-021-02984-w.

Grilli, D.J., K. Fliegerová, J. Kopečný, S.P. Lama, V. Egea, N. Sohaefer, C. Pereyra, M.S. Ruiz, M.A. Sosa, G.N. Arenas, and J. Mrázek. 2016. Analysis of the rumen bacterial diversity of goats during shift from forage to concentrate diet. Anaerobe 42:17–26. doi:10.1016/j.anaerobe.2016.07.002.

Gross, J.J. 2023. Dairy cow physiology and production limits. Animal Frontiers 13:44–50. doi:10.1093/af/vfad014.

Gu, X., and C. qi Gao. 2022. New horizons for selenium in animal nutrition and functional foods. Animal Nutrition 11:80–86. doi:10.1016/j.aninu.2022.06.013.

Guilloteau, P., L. Martin, V. Eeckhaut, R. Ducatelle, R. Zabielski, and F. Van Immerseel. 2010. From the gut to the peripheral tissues: The multiple effects of butyrate. Nutr Res Rev 23:366–384. doi:10.1017/S0954422410000247.

Gunun, P., M. Wanapat, and N. Anantasook. 2013. Rumen fermentation and performance of lactating dairy cows affected by physical forms and urea treatment of rice straw. Asian-Australas J Anim Sci 26:1295–1303. doi:10.5713/ajas.2013.13094.

Guo, Z., S. Gao, J. Ouyang, L. Ma, and D. Bu. 2021. Impacts of heat stress-induced oxidative stress on the milk protein biosynthesis of dairy cows. Animals 11:1–14. doi:10.3390/ani11030726.

Habimana, V., A.S. Nguluma, Z.C. Nziku, C.C. Ekine-Dzivenu, G. Morota, R. Mrode, and S.W. Chenyambuga. 2023. Heat stress effects on milk yield traits and metabolites and mitigation strategies for dairy cattle breeds reared in

tropical and sub-tropical countries. Front Vet Sci 10:1121499. doi:10.3389/fvets.2023.1121499.

Hachemi, M.A., J.R. Sexton, M. Briens, and N.L. Whitehouse. 2023. Efficacy of feeding hydroxy-selenomethionine on plasma and milk selenium in mid-lactation dairy cows. J Dairy Sci 106:2374–2385. doi:10.3168/jds.2022-22323.

Hall, J.A., G. Bobe, W.R. Vorachek, K. Kasper, M.G. Traber, W.D. Mosher, G.J. Pirelli, and M. Gamroth. 2014. Effect of supranutritional organic selenium supplementation on postpartum blood micronutrients, antioxidants, metabolites, and inflammation biomarkers in selenium-replete dairy cows. Biol Trace Elem Res 161:272–287. doi:10.1007/s12011-014-0107-4.

Halliwell, G. 1961. The action of cellulolytic enzymes from Myrothecium verrucaria.. Biochem J 79:185–192. doi:10.1042/bj0790185.

Halliwell, G., and J. Lovelady. 1981. Utilization of carboxymethylcellulose and enzyme synthesis by Trichoderma koningii. J Gen Microbiol 126:211–217. doi:10.1099/00221287-126-1-211.

Hamid, M., Y. Abdulrahim, D. Liu, F.N. Awad, N.A. Omer, A. Khan, and K. Huang. 2021. Selenium enriched yeast and Gum Arabic combination attenuate oxidative liver damage via suppression of oxidative stress, inhibition of caspase-3 and pro-inflammatory genes expression in carbon tetrachloride-intoxicated rats. Bioactive Carbohydrates and Dietary Fibre 26. doi:10.1016/j.bcdf.2021.100267.

Hao, Y., C. Guo, Y. Gong, X. Sun, W. Wang, Y. Wang, H. Yang, Z. Cao, and S. Li. 2021. Rumen fermentation, digestive enzyme activity, and bacteria composition between pre-weaning and post-weaning dairy calves. Animals 11:1–13. doi:10.3390/ani11092527.

Haryanto, B. 2012. Perkembangan penelitian nutrisi ruminansia. Wartozoa 22:169–177.

Hasani, M., A. Saidpour, P. Irandoost, F. Golab, M. Khazdouz, M. Qorbani, F. Agh, A. Mohammad Sharifi, and M. Vafa. 2021. Beneficial effects of Se/Zn co-supplementation on body weight and adipose tissue inflammation in high-fat diet-induced obese rats. Food Sci Nutr 9:3414–3425. doi:10.1002/fsn3.2203.

Hassan, F., S. Mobarez, M. Mohamed, Y. Attia, A. Mekawy, and K. Mahrose. 2021. Zinc and/or selenium enriched spirulina as antioxidants in growing rabbit diets to alleviate the deleterious impacts of heat stress during summer season. Animals 11:1–11. doi:10.3390/ani11030756.

Hefnawy, A.E.G., and J.L. Tórtora-Pérez. 2010. The importance of selenium and the effects of its deficiency in animal health. Small Ruminant Research 89:185–192. doi:10.1016/j.smallrumres.2009.12.042.

Heinritz, S.N., E. Weiss, M. Eklund, T. Aumiller, S. Louis, A. Rings, S. Messner, A. Camarinha-Silva, J. Seifert, S.C. Bischoff, and R. Mosenthin. 2016. Intestinal microbiota and microbial metabolites are changed in a pig model fed a high-fat/low-fiber or a low-fat/high-fiber diet. PLoS One 11:1–21. doi:10.1371/journal.pone.0154329.

Hekal, H.A., M.E. Amer, M. Amer, M.A. El-Missiry, and A.I. Othman. 2024. Selenium suppressed growth of Ehrlich solid tumor and improved health of tumor-bearing mice. J Exp Zool A Ecol Integr Physiol 341:672–682. doi:https://doi.org/10.1002/jez.2815.

Hendawy, A.O., S. Sugimura, K. Sato, M.M. Mansour, A.H.A. El-aziz, H. Samir, A. Islam, A.B.M.R. Bostami, A.S. Mandour, A. Elfadadny, R.F. Ragab, H.A.

Abdelmageed, and A.M. Ali. 2022. Effects of selenium supplementation on rumen microbiota, rumen fermentation, and apparent nutrient digestibility of ruminant animals: A review. Fermentation 8:1–23. doi:https://doi.org/10.3390/fermentation8010004.

Hernandez-Calva, L.M., M.I. Guerrero-Legarreta, M.L. Pérez-Chabela, R. López-Arellano, and J.E. Ramírez-Bribiesca. 2007. Interaction of dietary selenium and magnesium level on digestive function in lambs fed high-concentrate diets. J Appl Anim Res 31:41–46. doi:10.1080/09712119.2007.9706627.

Hidayah, N., B. Guntoro, E. Sulastri, and Y.Y. Suranindyah. 2015. Integrated approach in developing sustainable tropical animal production trends dairy population and milk production in Boyolali, Central Java, Indonesia. Pages 410–414 in The 6th International Seminar on Tropical Animal Production, Yogyakarta, Indonesia.

Hidiroglou, M., D.P. Heaney, and K.J. Jenkins. 1968. Metabolism of inorganic selenim in rumen bacteria. Can J Physiol Pharmacol 46:229–232. doi:https://doi.org/10.1139/y68-038.

Hilal, E.Y., M.A.E. Elkhairey, and A.A.A. Osman. 2016. The role of zinc, manganse and copper in rumen metabolism and immune function: A review article. Open J Anim Sci 06:304–324. doi:10.4236/ojas.2016.64035.

Hill, K.E., S. Wu, A.K. Motley, T.D. Stevenson, V.P. Winfrey, M.R. Capecchi, J.F. Atkins, and R.F. Burk. 2012. Production of selenoprotein P (Sepp1) by hepatocytes is central to selenium homeostasis. Journal of Biological Chemistry 287:40414–40424. doi:10.1074/jbc.M112.421404.

Hoac, T., T. Lundh, S. Purup, G. Önning, K. Sejrsen, and B. Åkesson. 2007. Separation of selenium, zinc, and copper compounds in bovine whey using size exclusion chromatography linked to inductively coupled plasma mass spectrometry. Pages 4237–4243 in Journal of Agricultural and Food Chemistry.

Hoac, T., J. Stagsted, T. Lundh, J.H. Nielsen, and B. Åkesson. 2008. Short-term effects of selenium supplementation of cows' feed on the content and distribution of selenium, copper and zinc in bovine milk, whey and blood plasma. Journal of Dairy Research 75:326–334. doi:10.1017/S0022029908003324.

Hoffmann, P.R., and M.J. Berry. 2008. The influence of selenium on immune responses. Mol Nutr Food Res 52:1273–1280. doi:10.1002/mnfr.200700330.

Horký, P. 2015. Effect of selenium on its content in milk and performance of dairy cows in ecological farming. Potravinarstvo 9:324–329. doi:10.5219/492.

Hou, P., B. Li, Y. Wang, D. Li, X. Huang, W. Sun, X. Liang, and E. Zhang. 2023. The effect of dietary supplementation with zinc amino acids on immunity, antioxidant capacity, and gut microbiota composition in calves. Animals 13:1–15. doi:10.3390/ani13091570.

Hristov, A.N., A. Melgar, D. Wasson, and C. Arndt. 2022. Symposium review: Effective nutritional strategies to mitigate enteric methane in dairy cattle. J Dairy Sci 105:8543–8557. doi:10.3168/jds.2021-21398.

Hua, D., W.H. Hendriks, B. Xiong, and W.F. Pellikaan. 2022. Starch and cellulose degradation in the rumen and applications of metagenomics on ruminal microorganisms. Animals 12:3020. doi:10.3390/ani12213020.

Hua, D., Y. Zhao, X. Nan, F. Xue, Y. Wang, L. Jiang, and B. Xiong. 2021. Effect of different glucogenic to lipogenic nutrient ratios on rumen fermentation and

bacterial community in vitro. J Appl Microbiol 130:1868–1882. doi:10.1111/jam.14873.

Huang, C., F. Ge, X. Yao, X. Guo, P. Bao, X. Ma, X. Wu, M. Chu, P. Yan, and C. Liang. 2021. Microbiome and metabolomics reveal the effects of different feeding systems on the growth and ruminal development of yaks. Front Microbiol 12:1–16. doi:10.3389/fmicb.2021.682989.

Huang, Y., C. Jiang, Y. Hu, X. Zhao, C. Shi, Y. Yu, C. Liu, Y. Tao, H. Pan, Y. Feng, J. Liu, Y. Wu, and D. Wang. 2013. Immunoenhancement effect of rehmannia glutinosa polysaccharide on lymphocyte proliferation and dendritic cell. Carbohydr Polym 96:516–521. doi:10.1016/j.carbpol.2013.04.018.

Huang, Z., A.H. Rose, and P.R. Hoffmann. 2012. The role of selenium in inflammation and immunity: From molecular mechanisms to therapeutic opportunities. Antioxid Redox Signal 16:705–743. doi:10.1089/ars.2011.4145.

Huhtanen, P., and M. Hetta. 2012. Comparison of feed intake and milk production responses in continuous and change-over design dairy cow experiments. Livest Sci 143:184–194. doi:10.1016/j.livsci.2011.09.012.

Hussein, A.M.S., K. Fouda, S.S. Abozed, R.S. Mohamed, M.F. Salama, and M.M. Hussein. 2021. Improvement of growth retardation and related immunodeficiency by dietary intervention with crackers containing animal source ingredients in malnourished rats. Current Research in Nutrition and Food Science 9:875–889. doi:10.12944/CRNFSJ.9.3.15.

Ianni, A., D. Innosa, C. Martino, L. Grotta, F. Bennato, and G. Martino. 2019. Zinc supplementation of Friesian cows: Effect on chemical-nutritional composition and aromatic profile of dairy products. J Dairy Sci 102:2918–2927. doi:10.3168/jds.2018-15868.

Ibrahim, N.A., A.R. Alimon, H. Yaakub, A.A. Samsudin, S.C.L. Candyrine, W.N. Wan Mohamed, A. Md Noh, M.A. Fuat, and S. Mookiah. 2021. Effects of vegetable oil supplementation on rumen fermentation and microbial population in ruminant: a review. Trop Anim Health Prod 53:422. doi:10.1007/s11250-021-02863-4.

Indugu, N., B. Vecchiarelli, L.D. Baker, J.D. Ferguson, J.K.P. Vanamala, and D.W. Pitta. 2017. Comparison of rumen bacterial communities in dairy herds of different production. BMC Microbiol 17. doi:10.1186/s12866-017-1098-z.

Ingvartsen, K.L., and J.B. Andersen. 2000. Integration of metabolism and intake regulation: A review focusing on periparturient animals. J Dairy Sci 83:1573–1597. doi:10.3168/jds.S0022-0302(00)75029-6.

Ingvartsen, K.L., and K. Moyes. 2013. Nutrition, immune function and health of dairy cattle. Animal 7:112–122. doi:10.1017/S175173111200170X.

Institute of Medicine. 2000. Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids. The National Academies Press, Washington, DC, USA.

Ishaq, S.L., C.M. Page, C.J. Yeoman, T.W. Murphy, M.L. Van Emon, and W.C. Stewart. 2019. Zinc AA supplementation alters yearling ram rumen bacterial communities but zinc sulfate supplementation does not. J Anim Sci 97:687–697. doi:10.1093/jas/sky456.

Ismoyowati, I., R. Rosidi, N. Hidayat, and M.A. Yakubu. 2024. The impact of selenium yeast and vitamin E in blood profile and egg production of laying hens at the end of egg production period. J. Indonesian Trop. Anim. Agric 49:41–50. doi:10.14710/jitaa.49.1.

Ivancic, J., and W.P. Weiss. 2001. Effect of dietary sulfur and selenium concentrations on selenium balance of lactating Holstein cows. J Dairy Sci 84:225–232. doi:10.3168/jds.S0022-0302(01)74472-4.

Iyer, S.S., and G. Cheng. 2012. Role of interleukin 10 transcriptional regulation in inflammation and autoimmune disease. Crit Rev Immunol 32:23–63. doi:10.1615/critrevimmunol.v32.i1.30.

Jahroh, S., J. Atmakusuma, H. Harmini, and A. Fadillah. 2020. Comparative analysis of dairy farming management and business model between East Java and West Java, Indonesia. Jurnal Manajemen dan Agribisnis 17:96–107. doi:10.17358/jma.17.1.96.

Jamali, M., K. Rezayazdi, M. Sadeghi, M. Zhandi, P. Moslehifar, A. Rajabinejad, H. Fakooriyan, H. Gholami, R. Akbari, and M. Salehi Dindarlou. 2022. Effect of selenium on growth performance and blood parameters of Holstein suckling calves. Journal of Central European Agriculture 23:1–8. doi:10.5513/JCEA01/23.1.3360.

Jamarun, N., R. Pazla, A. Jayanegara, and G. Yanti. 2020. Chemical composition and rumen fermentation profile of mangrove leaves (Avicennia marina) from West Sumatra, Indonesia. Biodi 21:5230–5236. doi:10.13057/biodiv/d211126.

Jami, E., B.A. White, and I. Mizrahi. 2014. Potential role of the bovine rumen microbiome in modulating milk composition and feed efficiency. PLoS One 9:e85423. doi:10.1371/journal.pone.0085423.

Jewell, K.A., C.A. McCormick, C.L. Odt, P.J. Weimer, and G. Suen. 2015. Ruminal bacterial community composition in dairy cows is dynamic over the course of two lactations and correlates with feed efficiency. Appl Environ Microbiol 81:4697–4710. doi:10.1128/AEM.00720-15.

Jia, W., Z. Jia, W. Zhang, R. Wang, S. Zhang, and X. Zhu. 2008. Effects of dietary zinc on performance, nutrient digestibility and plasma zinc status in Cashmere goats. Small Ruminant Research 80:68–72. doi:10.1016/j.smallrumres.2008.09.009.

Jihen, E.H., M. Imed, H. Fatima, and K. Abdelhamid. 2008. Protective effects of selenium (Se) and zinc (Zn) on cadmium (Cd) toxicity in the liver and kidney of the rat: Histology and Cd accumulation. Food and Chemical Toxicology 46:3522–3527. doi:10.1016/j.fct.2008.08.037.

Jihen, E.H., M. Imed, H. Fatima, and K. Abdelhamid. 2009. Protective effects of selenium (Se) and zinc (Zn) on cadmium (Cd) toxicity in the liver of the rat: Effects on the oxidative stress. Ecotoxicol Environ Saf 72:1559–1564. doi:10.1016/j.ecoenv.2008.12.006.

Johnston, D.J., K. Theodoridou, A.W. Gordon, T. Yan, W.C. McRoberts, and C.P. Ferris. 2019. Field bean inclusion in the diet of early-lactation dairy cows: Effects on performance and nutrient utilization. J Dairy Sci 102:10887–10902. doi:10.3168/jds.2019-16513.

Jones, M., and G. Jones. 2012. Animal Nutrition. 7th ed. Pearson Education Limited, England UK.

Joulaei, H., P. Keshani, M. Ashourpour, P. Bemani, S. Amiri, J. Rahimi, M. Aliakbarpour, and A. Salehi-Abargouei. 2021. The prevalence of stunting among children and adolescents living in the Middle East and North Africa region (MENA): A systematic review and meta-analysis. J Glob Health 11:1–12. doi:10.7189/JOGH.11.04070.

Juniper, D.T., R.H. Phipps, and G. Bertin. 2011. Effect of dietary supplementation with selenium-enriched yeast or sodium selenite on selenium tissue distribution and meat quality in commercial-line turkeys. Animal 5:1751–1760. doi:10.1017/S1751731111000796.

Juniper, D.T., R.H. Phipps, A.K. Jones, and G. Bertin. 2006. Selenium supplementation of lactating dairy cows: Effect on selenium concentration in blood, milk, urine, and feces. J Dairy Sci 89:3544–3551. doi:10.3168/jds.S0022-0302(06)72394-3.

Kandilarov, I., P. Gardjeva, M. Georgieva-Kotetarova, H. Zlatanova, N. Vilmosh, I. Kostadinova, M. Katsarova, K. Atliev, and S. Dimitrova. 2023. Effect of plant extracts combinations on TNF-α, IL-6 and IL-10 Levels in serum of rats exposed to acute and chronic Stress. Plants 12. doi:10.3390/plants12173049.

Kang, S., R. Li, H. Jin, H.J. You, and G.E. Ji. 2020. Effects of selenium- and zinc-enriched lactobacillus plantarum sezi on antioxidant capacities and gut microbiome in an icr mouse model. Antioxidants 9:1–14. doi:10.3390/antiox9101028.

Kang, S., and M. Wanapat. 2013. Using plant source as a buffering agent to manipulating rumen fermentation in an in vitro gas production system. Asian-Australas J Anim Sci 26:1424–1436.

Katongole, C.B., and T. Yan. 2020. Effect of varying dietary crude protein level on feed intake, nutrient digestibility, milk production, and nitrogen use efficiency by lactating Holstein-friesian cows. Animals 10:1–14.

Kementan. 2022. Outlook Susu. Pusat Data dan Sistem Informasi Pertanian Sekretariat Jenderal Kementerian Pertanian, Jakarta.

Van Keulen, J., and B.A. Young. 1977. Evaluation of acid-insoluble ash as a natural marker in ruminant digestibility studies. J Anim Sci 44:282–287. doi:https://doi.org/10.2527/jas1977.442282x.

Khalil, A. Bachtiar, and Z. Udin. 2019. Effects of mineral supplementation on reproductive efficiency of Simmental heifers. Asian Journal of Agriculture and Biology 7:396–403.

Khalili, M., M. Chamani, H. Amanlou, A. Nikkhah, and A.A. Sadeghi. 2019. Effects of different sources of selenium supplementation on antioxidant indices, biochemical parameters, thyroid hormones and se status in transition cows. Acta Sci 41:1–7. doi:10.4025/actascianimsci.v41i1.44392.

Kieliszek, M., and S. Błazejak. 2016. Current knowledge on the importance of selenium in food for living organisms: A review. Molecules 21:609. doi:10.3390/molecules21050609.

Kim, B.R., J. Shin, R.B. Guevarra, J.H. Lee, D.W. Kim, K.H. Seol, J.H. Lee, H.B. Kim, and R.E. Isaacson. 2017a. Deciphering diversity indices for a better understanding of microbial communities. J Microbiol Biotechnol 27:2089–2093. doi:10.4014/jmb.1709.09027.

Kim, J.E., and H.G. Lee. 2021a. Amino acids supplementation for the milk and milk protein production of dairy cows. Animals 11:2118. doi:10.3390/ani11072118.

Kim, J.E., and H.G. Lee. 2021b. Amino acids supplementation for the milk and milk protein production of dairy cows. Animals 11:2118. doi:10.3390/ani11072118.

Kim, J.N., C. Méndez–García, R.R. Geier, M. Iakiviak, J. Chang, I. Cann, and R.I. Mackie. 2017b. Metabolic networks for nitrogen utilization in Prevotella ruminicola 23. Sci Rep 7:1–11. doi:10.1038/s41598-017-08463-3.

Kim, Y.H., R. Nagata, A. Ohkubo, N. Ohtani, S. Kushibiki, T. Ichijo, and S. Sato. 2018. Changes in ruminal and reticular pH and bacterial communities in

Holstein cattle fed a high-grain diet. BMC Vet Res 14. doi:10.1186/s12917-018-1637-3.

Kimura, T., and T. Kambe. 2016. The functions of metallothionein and ZIP and ZnT transporters: An overview and perspective. Int J Mol Sci 17:10–12. doi:10.3390/ijms17030336.

Kitilit, J.K., D.K. Kios, K. Changwony, H.A. Rachuonyo, and G.M. Mureithi. 2018. Effect of concentrate supplementation on milk yield and density in dairy farms. African Journal of Education, Science and Technology 1:111–114. doi:https://doi.org/https://doi.org/10.2022/ajest.v1i3.200.

Klang, J., S. Theuerl, U. Szewzyk, M. Huth, R. Tölle, and M. Klocke. 2015. Dynamic variation of the microbial community structure during the long-time mono-fermentation of maize and sugar beet silage. Microb Biotechnol 8:764–775. doi:10.1111/1751-7915.12263.

Klopčič, M., A. Hamoen, and J. Rey Bewley. 2011. Body Condition Scoring of Dairy Cows. Biotechnical Faculty, Department of Animal Science, Domžale:

Knowles, S.O., N.D. Grace, K. Wurms, and J. Lee. 1999. Significance of amount and form of dietary selenium on blood, milk, and casein selenium concentrations in grazing cows. J Dairy Sci 82:429–437. doi:10.3168/jds.S0022-0302(99)75249-5.

Kolver, E.S., and M.J. De Veth. 2002. Prediction of ruminal pH from pasture-based diets. J Dairy Sci 85:1255–1266. doi:10.3168/jds.S0022-0302(02)74190-8.

Kong, Y., R. Teather, and R. Forster. 2010. Composition, spatial distribution, and diversity of the bacterial communities in the rumen of cows fed different forages. FEMS Microbiol Ecol 74:612–622. doi:10.1111/j.1574-6941.2010.00977.x.

Koyuncu, M., and H. Yerlikaya. 2007. Effect of selenium-vitamin E injections of ewes on reproduction and growth of their lambs. South African Journal of Animal Sciences 37:233–236. doi:10.4314/sajas.v37i4.4095.

Kumar, V., D.S. Sahu, N. Ali, R. Kumar, S.P. Yadav, G. Chandra, D. Roy, and P.S. Maurya. 2021. Influence of zinc yeast supplementation on growth performance, antioxidant, and immune status of growing Sahiwal calves. Proceedings of the National Academy of Sciences India Section B - Biological Sciences 91:373–379. doi:10.1007/s40011-021-01228-z.

Kvidera, S.K., E.A. Horst, M. Abuajamieh, E.J. Mayorga, M.V.S. Fernandez, and L.H. Baumgard. 2017. Glucose requirements of an activated immune system in lactating Holstein cows. J Dairy Sci 100:2360–2374. doi:10.3168/jds.2016-12001.

Laurence, D.R., and A.L. Bacharach. 1964. Evaluation of Drug Activities: Pharmacometrics. 1st ed. Academic Press, London, New York.

Law, R.A., F.J. Young, D.C. Patterson, D.J. Kilpatrick, A.R.G. Wylie, K.L. Ingvarsten, A. Hameleers, M.A. McCoy, C.S. Mayne, and C. Ferris. 2011. Effect of precalving and postcalving dietary energy level on performance and blood metabolite concentrations of dairy cows throughout lactation. J Dairy Sci 94:808–823. doi:10.3168/jds.2009-2728.

Law, R.A., F.J. Young, D.C. Patterson, D.J. Kilpatrick, A.R.G. Wylie, and C.S. Mayne. 2009. Effect of dietary protein content on animal production and blood metabolites of dairy cows during lactation. J Dairy Sci 92:1001–1012. doi:10.3168/jds.2008-1155.

Le, G., L. Yang, H. Du, L. Hou, L. Ge, A. Sylia, A. Muhmood, X. Chen, B. Han, and K. Huang. 2022. Combination of zinc and selenium alleviates ochratoxin A-

induced fibrosis via blocking ROS-dependent autophagy in HK-2 cells. Journal of Trace Elements in Medicine and Biology 69. doi:10.1016/j.jtemb.2021.126881.

Lee, C., J.E. Copelin, P.A. Dieter, and E.A. Berry. 2020. Effects of trace mineral supply from rumen boluses on performance, carcass characteristics, and fecal bacterial profile in beef cattle. Anim Feed Sci Technol 269. doi:10.1016/j.anifeedsci.2020.114626.

Lee, C., A.N. Hristov, K.S. Heyler, T.W. Cassidy, H. Lapierre, G.A. Varga, and C. Parys. 2012. Effects of metabolizable protein supply and amino acid supplementation on nitrogen utilization, milk production, and ammonia emissions from manure in dairy cows. J Dairy Sci 95:5253–5268. doi:10.3168/jds.2012-5366.

Lenártová, V., K. Holovská, and P. Javorský. 1998. The influence of mercury on the antioxidant enzyme activity of rumen bacteria Streptococcus bovis and Selenomonas ruminantium. FEMS Microbiol Ecol 27:319–325. doi:10.1016/S0168-6496(98)00077-4.

Lepetsos, P., K.A. Papavassiliou, and A.G. Papavassiliou. 2019. Redox and NF-κB signaling in osteoarthritis. Free Radic Biol Med 132:90–100. doi:10.1016/j.freeradbiomed.2018.09.025.

Lestari, D.A., L. Abdullah, and Despal. 2015. Comparative study of milk production and feed efficiency based on farmers best practices and national research council. Media Peternakan Fakultas Peternakan Institut Pertanian Bogor 38:110–117. doi:10.5398/medpet.2015.38.2.110.

Li, M.M., S. Ghimire, B.A. Wenner, R.A. Kohn, J.L. Firkins, B. Gill, and M.D. Hanigan. 2022a. Effects of acetate, propionate, and pH on volatile fatty acid thermodynamics in continuous cultures of ruminal contents. J Dairy Sci 105:8879–8897. doi:10.3168/jds.2022-22084.

Li, S., W. Sun, K. Zhang, J. Zhu, X. Jia, X. Guo, Q. Zhao, C. Tang, J. Yin, and J. Zhang. 2021a. Selenium deficiency induces spleen pathological changes in pigs by decreasing selenoprotein expression, evoking oxidative stress, and activating inflammation and apoptosis. J Anim Sci Biotechnol 12. doi:10.1186/s40104-021-00587-x.

Li, Y., J.X. Liu, J.L. Xiong, Y.M. Wang, W.X. Zhang, and D.M. Wang. 2019. Effect of hydroxyselenomethionine on lactation performance, blood profiles, and transfer efficiency in early-lactating dairy cows. J Dairy Sci 102:6167–6173. doi:10.3168/jds.2019-16241.

Li, Y., W. Zhang, H. Zhou, J. Zhu, and C. Pan. 2022b. Effects of hydroxyselenomethionine with symmetrical and chelated chemical structure on lactation performances, anti-oxidative status and immunities, selenium transfer efficiencies for early-lactating dairy cows. Symmetry (Basel) 14:1–10. doi:10.3390/sym14050916.

Li, Z., Y. Dong, S. Chen, X. Jia, X. Jiang, L. Che, Y. Lin, J. Li, B. Feng, Z. Fang, Y. Zhuo, J. Wang, H. Xu, D. Wu, and S. Xu. 2021b. Organic selenium increased gilts antioxidant capacity, immune function, and changed intestinal microbiota. Front Microbiol 12:723190. doi:10.3389/fmicb.2021.723190.

Li, Z., H. Qiu, X. Lan, Z. Wang, W. Shen, F. Wan, D. Xiao, and J. He. 2023. Appropriate particle size of rice straw promoted rumen fermentation and regulated bacterial microbiota in a rumen simulation technique system. Front Vet Sci 10:1–9. doi:10.3389/fvets.2023.1185191.

Lianou, D.T., C.K. Michael, D.A. Gougoulis, P.J. Cripps, N.G.C. Vasileiou, N. Solomakos, E. Petinaki, A.I. Katsafadou, E. Angelidou, K. V. Arsenopoulos, E. Papadopoulos, M. Albenzio, V.S. Mavrogianni, M. Caroprese, and G.C. Fthenakis. 2022. High milk somatic cell counts and increased teladorsagia burdens overshadow non-infection-related factors as predictors of fat and protein content of bulk-tank raw milk in sheep and goat farms. Foods 11:443. doi:10.3390/foods11030443.

Lin, Y., X. Sun, X. Hou, B. Qu, X. Gao, and Q. Li. 2016. Effects of glucose on lactose synthesis in mammary epithelial cells from dairy cow. BMC Vet Res 12. doi:10.1186/s12917-016-0704-x.

Liu, H., Z. Li, C. Pei, A. Degen, L. Hao, X. Cao, H. Liu, J. Zhou, and R. Long. 2022a. A comparison between yaks and Qaidam cattle in in vitro rumen fermentation, methane emission, and bacterial community composition with poor quality substrate. Anim Feed Sci Technol 291:1–16. doi:10.1016/j.anifeedsci.2022.115395.

Liu, K., Y. Zhang, G. Huang, N. Zheng, S. Zhao, and J. Wang. 2022b. Ruminal bacterial community is associated with the variations of total milk solid content in Holstein lactating cows. Animal Nutrition 9:175–183. doi:10.1016/j.aninu.2021.12.005.

Liu, Q., C. Wang, Y. Huang, C. Miao, and D. Gao. 2007. Effects of Sel-Plex on rumen fermentation and purine derivatives of urine in Simmental steers. J Anim Feed Sci 16:133–138. doi:10.22358/jafs/75597/2007.

Liu, Q., Y. Wang, Y. Wan, Y. Liang, Y. Tan, M. Wei, and T. Hou. 2024. Selenium- and/or zinc-enriched egg diet improves oxidative damage and regulates gut microbiota in D-Gal-induced aging mice. Nutrients 16. doi:10.3390/nu16040512.

Liu, Y.J., C. Wang, Q. Liu, G. Guo, W.J. Huo, Y.L. Zhang, C.X. Pei, S.L. Zhang, and J. Zhang. 2019. Effects of sodium selenite addition on ruminal fermentation, microflora and urinary excretion of purine derivatives in Holstein dairy bulls. J Anim Physiol Anim Nutr (Berl) 103:1719–1726. doi:10.1111/jpn.13193.

Liu, Y.J., Z.D. Zhang, S.H. Dai, Y. Wang, X.F. Tian, J.H. Zhao, C. Wang, Q. Liu, G. Guo, and W.J. Huo. 2020. Effects of sodium selenite and coated sodium selenite addition on performance, ruminal fermentation, nutrient digestibility and hepatic gene expression related to lipid metabolism in dairy bulls. Livest Sci 237:1–7. doi:10.1016/j.livsci.2020.104062.

Long, M., S. Yang, W. Zhang, Y. Zhang, P. Li, Y. Guo, Y. Wang, X. Chen, and J. He. 2016. The Influence of selenium yeast on hematological, biochemical and reproductive hormone level changes in Kunming mice following acute exposure to zearalenone. Biol Trace Elem Res 174:362–368. doi:10.1007/s12011-016-0725-0.

Longnecker, M.P., D.O. Stram, P.R. Taylor, O.A. Levander, M. Howe, C. Veillon, P.A. McAdam, K.Y. Patterson, J.M. Holden, J.S. Morris, C.A. Swanson, and W.C. Willet. 1996. Use of selenium concentration in whole blood, serum, toenails, or urine as a surrogate measure of selenium intake. Epidemiology 7:384–390.

Luick, J.R. 1961. Synthesis of milk fat in the bovine mammary gland. J Dairy Sci 44:652–657. doi:https://doi.org/10.3168/jds.S0022-0302(61)89796-8.

Lv, F., X. Wang, X. Pang, and G. Liu. 2020. Effects of supplementary feeding on the rumen morphology and bacterial diversity in lambs. PeerJ 8:1–20. doi:10.7717/peerj.9353.

Ma, X., M. Qian, Z. Yang, T. Xu, and X. Han. 2021. Effects of zinc sources and levels on growth performance, zinc status, expressions of zinc transporters, and zinc bioavailability in weaned piglets. Animals 11:1–15. doi:10.3390/ani11092515.

Mackie, R.I., C.S. McSweeney, and R.I. Aminov. 2022. Rumen.

Mahowald, M.A., F.E. Rey, H. Seedorf, P.J. Turnbaugh, R.S. Fulton, A. Wollam, N. Shah, C. Wang, V. Magrini, R.K. Wilson, B.L. Cantarel, P.M. Coutinho, B. Henrissat, L.W. Crock, A. Russell, N.C. Verberkmoes, R.L. Hettich, and J.I. Gordon. Characterizing a model human gut microbiota composed of members of its two dominant bacterial phyla. doi:https://doi.org/10.1073/pnas.090152910.

Malathi, S., and R. Chakraborty. 1991. Production of alkaline protease by a new Aspergillus flavus isolate under solid substrate fermentation conditions for use as a depilation agent. Applied Environmental Microbiology 57:712–716. doi:10.1128/aem.57.3.712-716.1991.

Malbe, M., M. Klaassen, W. Fang, V. Myllys, M. Vikerpuur, K. Nyholm, S. Sankari, K. Suoranta, and M. Sandholm. 1995. Comparisons of Selenite and Selenium Yeast Feed Supplements on Se-incorporation, Mastitis and Leucocyte Function in Se-deficient Dairy Cows. Journal of Veterinary Medicine Series A 42:111–121. doi:10.1111/j.1439-0442.1995.tb00362.x.

Maldonado Galdeano, C., I. Novotny Núñez, A. De Moreno De Leblanc, E. Carmuega, R. Weill, and G. Perdigón. 2011. Impact of a probiotic fermented milk in the gut ecosystem and in the systemic immunity using a non-severe protein-energy-malnutrition model in mice. Gastroenterology 11:64.

Malyar, R.M., H. Li, D. Liu, Y. Abdulrahim, R.A. Farid, F. Gan, W. Ali, H. Enayatullah, S.A.H. Banuree, K. Huang, and X. Chen. 2020. Selenium/Zinc-Enriched probiotics improve serum enzyme activity, antioxidant ability, inflammatory factors and related gene expression of Wistar rats inflated under heat stress. Life Sci 248. doi:10.1016/j.lfs.2020.117464.

Marciel, M.P., and P.R. Hoffmann. 2019. Molecular mechanisms by which selenoprotein K regulates immunity and cancer. Biol Trace Elem Res 192:60–68. doi:10.1007/s12011-019-01774-8.

Mardones, L., and M. Villagrán. 2020. Lactose Synthesis. N. Gutiérrez-Méndez, ed. IntechOpen, Rijeka.

Mariana, E., C. Sumantri, D.A. Astuti, A. Anggraeni, and A. Gunawan. 2019. Thermoregulation, haematological profile and productivity of Holstein Friesian under heat stress at different land elevations. Buletin Peternakan 43. doi:10.21059/buletinpeternak.v43i1.37648.

Marreiro, D. do N., K.J.C. Cruz, J.B.S. Morais, J.B. Beserra, J.S. Severo, and A.R. Soares de Oliveira. 2017. Zinc and oxidative stress: Current mechanisms. Antioxidants 6. doi:10.3390/antiox6020024.

Marshall, J.S., R. Warrington, W. Watson, and H.L. Kim. 2018. An introduction to immunology and immunopathology. Allergy, Asthma and Clinical Immunology 14:49. doi:10.1186/s13223-018-0278-1.

Martin, M. 2011. Cutadapt removes adapter sequences from high-throughput sequencing reads. EMBnet Journal 17:10–11. doi:https://doi.org/10.14806/ej.17.1.200.

Martino, C., A. Ianni, L. Grotta, F. Pomilio, and G. Martino. 2019. Influence of zinc feeding on nutritional quality, oxidative stability and volatile profile of fresh and ripened ewes' milk cheese. Foods 8:1–12. doi:10.3390/foods8120656.

Matthews, C., F. Crispie, E. Lewis, M. Reid, P.W. O'Toole, and P.D. Cotter. 2019. The rumen microbiome: a crucial consideration when optimising milk and meat production and nitrogen utilisation efficiency. Gut Microbes 10:115–132. doi:10.1080/19490976.2018.1505176.

Mbuthia, J.M., A. Eggert, and N. Reinsch. 2022. Cooling temperature humidity index-days as a heat load indicator for milk production traits. Frontiers in Animal Science 3. doi:10.3389/fanim.2022.946592.

McDonald, P., R.A. Edwards, J.F.D. Greenhalgh, C.A. Morgan, L.A. Sinclair, and R.G. Wilkinson. 2010. Animal Nutrition. 7th ed. Pearson, Edinburg, UK.

McDowell, L.R. 2003a. Chapter 12 - Zinc.

McDowell, L.R. 2003b. Chapter 13 – Selenium.

McGuffey, R.K., and J.E. Shirley. 2011. Introduction | History of Dairy Farming. J.W. Fuquay, ed. Academic Press, San Diego.

Mehdi, Y., and I. Dufrasne. 2016. Selenium in cattle: A review. Molecules 21:1–4. doi:10.3390/molecules21040545.

Mekuriaw, Y. 2023. Negative energy balance and its implication on productive and reproductive performance of early lactating dairy cows: review paper. J Appl Anim Res 51:220–229. doi:10.1080/09712119.2023.2176859.

Mendes, G. da R.L., H.F. de Souza, J.P.A. Lopes, A.C.S. Rocha, R.B. Faria, F.R. dos Santos, B.M.A. de C. de Mesquita, S.H.S. Santos, C.A.F. Durães, S.R. Ferreira, S.C.O. de S. Boitrago, J.S. Leal, E.S. Kamimura, and I.V. Brandi. 2024. A fermented milk drink with Umbu (Spondias tuberosa) pulp and whey is effective for weight gain and re-nutrition in malnourished: An in vivo study in mice and children. Food Research International 181. doi:10.1016/j.foodres.2024.114083.

Meng, L., X. Jin, W. Song, R. Zhang, M. Tong, Z. Qi, and L. Mi. 2024. Dietary selenium levels affect mineral absorbability, rumen fermentation, microbial composition and metabolites of the grazing sheep. Anim Feed Sci Technol 308. doi:10.1016/j.anifeedsci.2024.115877.

Menke, H.H., and H. Steingass. 1988. Estimation of the energetic feed value obtained from chemical analysis and in vitro gas production using rumen fluid. Animal Research and Development 28:7–55.

Meschy, F. 2010. Nutrition Minérale Des Ruminants. Versaille, France.

Messaoudi, I., J. El Heni, F. Hammouda, K. Saïd, and A. Kerkeni. 2009. Protective effects of selenium, zinc, or their combination on cadmium-induced oxidative stress in rat kidney. Biol Trace Elem Res 130:152–161. doi:10.1007/s12011-009-8324-y.

Meyer, U., K. Heerdegen, H. Schenkel, S. Danicke, and G. Flachowsky. 2014. Influence of various selenium sources on selenium concentration in the milk of dairy cows. J. Verbr. Lebensm. 9:101–109. doi:10.1007/s00003-014-0870-3.

Mihaliková, K.M., L. Grešáková, K. Boldižárová, Š. Faix, L. Leng, and S. Kišidayová. 2005. The Effects of Organic Selenium Supplementation on the Rumen Ciliate Population in Sheep. Folia Microbiol (Praha) 50:353–356. doi:10.1007/BF02931418.

Milačič, R., D. Ajlec, T. Zuliani, D. Žigon, and J. Ščančar. 2012. Determination of Zn-citrate in human milk by CIM monolithic chromatography with atomic and

mass spectrometry detection. Talanta 101:203–210. doi:10.1016/j.talanta.2012.09.002.

Miller, M.E.B., C.J. Yeoman, N. Chia, S.G. Tringe, F.E. Angly, R.A. Edwards, H.J. Flint, R. Lamed, E.A. Bayer, and B.A. White. 2012. Phage-bacteria relationships and CRISPR elements revealed by a metagenomic survey of the rumen microbiome. Environ Microbiol 14:207–227. doi:10.1111/j.1462-2920.2011.02593.x.

Min, B.R., S. Lee, H. Jung, D.N. Miller, and R. Chen. 2022. Enteric methane emissions and animal performance in dairy and beef cattle production: Strategies, opportunities, and impact of reducing emissions. Animals 12. doi:10.3390/ani12080948.

Mion, B., B. Van Winters, K. King, J.F.W. Spricigo, L. Ogilvie, L. Guan, T.J. DeVries, B.W. McBride, S.J. LeBlanc, M.A. Steele, and E.S. Ribeiro. 2022. Effects of replacing inorganic salts of trace minerals with organic trace minerals in pre- and postpartum diets on feeding behavior, rumen fermentation, and performance of dairy cows. J Dairy Sci 105:6693–6709. doi:10.3168/jds.2022-21908.

Mir, S.H., V. Mani, R.P. Pal, T.A. Malik, and H. Sharma. 2020. Zinc in Ruminants: Metabolism and Homeostasis. Proceedings of the National Academy of Sciences India Section B - Biological Sciences 90:9–19. doi:10.1007/s40011-018-1048-z.

Mistry, H.D., F.B. Pipkin, and C.W.G. Redman. 2012. Selenium in reproductive health. YMOB 206:21–30. doi:10.1016/j.ajog.2011.07.034.

Mitsumori, M., and W. Sun. 2008. Control of rumen microbial fermentation for mitigating methane emissions from the rumen. Asian-Australas J Anim Sci 21:144–154. doi:10.5713/ajas.2008.r01.

Mizrahi, I., and E. Jami. 2018. Review: The compositional variation of the rumen microbiome and its effect on host performance and methane emission. Animal 12:S220–S232. doi:10.1017/S1751731118001957.

Molnar-Nagy, V., K.H. Tso, J.W. Hall, G. Tellez-Isaias, X. Hernandez-Velasco, S. Layton, and Z. Bata. 2022. Effects of different nutritional zinc forms on the proliferation of beneficial commensal microorganisms. Microbiol Res (Pavia) 13:500–513. doi:10.3390/microbiolres13030034.

Monteiro, H.F., Z. Zhou, M.S. Gomes, P.M.G. Peixoto, E.C.R. Bonsaglia, I.F. Canisso, B.C. Weimer, and F.S. Lima. 2022. Rumen and lower gut microbiomes relationship with feed efficiency and production traits throughout the lactation of Holstein dairy cows. Sci Rep 12:4904. doi:10.1038/s41598-022-08761-5.

Morales, F., S. Montserrat-de la Paz, M.J. Leon, and F. Rivero-Pino. 2024. Effects of malnutrition on the immune system and infection and the role of nutritional strategies regarding improvements in children's health status: A literature review. Nutrients 16:1. doi:10.3390/nu16010001.

Mordak, R., and S.P. Anthony. 2015. Periparturient stress and immune suppression as a potential cause of retained placenta in highly productive dairy cows: Examples of prevention. Acta Vet Scand 57:1–8. doi:10.1186/s13028-015-0175-2.

Mousavi, S.N., A. Faghihi, M. Motaghinejad, M. Shiasi, F. Imanparast, H.L. Amiri, and F. Shidfar. 2018. Zinc and Selenium Co-supplementation Reduces Some Lipid Peroxidation and Angiogenesis Markers in a Rat Model of NAFLD-Fed

High Fat Diet. Biol Trace Elem Res 181:288–295. doi:10.1007/s12011-017-1059-2.

Mozart, G.G., F.B.N. Köptcke, L.A. Pinto, V.F. Moebus, W.P. Tamy, M. Aronovich, and L.A.M. Keller. 2024. Enhancement of dairy cow milk quality with probiotic and inorganic selenium supplementation. Dairy 5:336–345. doi:10.3390/dairy5020027.

Mu, T., H. Hu, Y. Ma, X. Feng, J. Zhang, and Y. Gu. 2021. Regulation of key genes for milk fat synthesis in ruminants. Front Nutr 8:765147. doi:10.3389/fnut.2021.765147.

Mueller, A.S., A.C. Bosse, E. Most, S.D. Klomann, S. Schneider, and J. Pallauf. 2009. Regulation of the insulin antagonistic protein tyrosine phosphatase 1B by dietary Se studied in growing rats. Journal of Nutritional Biochemistry 20:235–247. doi:10.1016/j.jnutbio.2008.02.007.

Muñiz-Naveiro, Ó., R. Domínguez-González, A. Bermejo-Barrera, J.A. Cocho, J.M. Fraga, and P. Bermejo-Barrera. 2005. Determination of total selenium and selenium distribution in the milk phases in commercial cow's milk by HG-AAS. Anal Bioanal Chem 381:1145–1151. doi:10.1007/s00216-004-3010-6.

Munteanu, C., and B. Schwartz. 2022. The relationship between nutrition and the immune system. Front Nutr 9:1082500. doi:10.3389/fnut.2022.1082500.

Naik, A.A., I.K. Patro, and N. Patro. 2015. Slow physical growth, delayed reflex ontogeny, and permanent behavioral as well as cognitive impairments in rats following intra-generational protein malnutrition. Front Neurosci 9:446. doi:10.3389/fnins.2015.00446.

Naito, K., T. Iio, M. Katagi, Y. Yoshikawa, H. Ohtsuka, and K. Orino. 2020. Binding analysis of bovine milk proteins, especially casein interactions and the interaction between α-casein and lactoferrin, using beads immobilised with zinc ion, poly-L-lysine or α-casein. Int Dairy J 105. doi:10.1016/j.idairyj.2020.104690.

Nemati, Z., K. Alirezalu, M. Besharati, B.W.B. Holman, M. Hajipour, and B.M. Bohrer. 2021. The effect of dietary supplementation with inorganic or organic selenium on the nutritional quality and shelf life of goose meat and liver. Animals 11:1–18. doi:10.3390/ani11020261.

Niba, A.T., J.D. Beal, A.C. Kudi, and P.H. Brooks. 2009. Bacterial fermentation in the gastrointestinal tract of non-ruminants: Influence of fermented feeds and fermentable carbohydrates. Trop Anim Health Prod 41:1393–1407. doi:10.1007/s11250-009-9327-6.

Nichols, K. 2015. Regulation of Translation by Essential Amino Acids and Glucose in Mammary Glands and Skeletal Muscle of Lactating Dairy Cows. The University of Guelph, Guelph, Ontario, Canada.

Nimmerjahn, F., and J. V Ravetch. 2010. Antibody-mediated modulation of immune responses.

Nogalski, Z., and A. Nogalska. 2023. Effect of milk performance and udder health on the zinc content of cow's milk. J Elem 28:1191–1202. doi:10.5601/jelem.2023.28.3.3136.

Nolan, T.D., and D. Brown. 2000. The influence of elevated dietary zinc, selenium, and their combination on the suppressive effect of dietary and intraperitoneal cadmium on egg production in laying hens. J Toxicol Environ Health A 60:549–565. doi:10.1080/00984100050082094.

NRC. 1970. A Guide to Environmental Research on Animals. National Academy of Sciences, Washington, DC, USA.

NRC. 2001. Nutrient Requirements of Dairy Cattle. Seventh. The National Academy Press, Washington, D.C.

Nurliyani, B.J.I. Kandarina, S. Kusuma, and Y.D. Trisnasari. 2014. Goat milk yoghurt by using lacto-B culture modulates the production of tumor necrosis factor-alpha and interleukin-10 in malnourished rats. Korean J Food Sci Anim Resour 34:88–98. doi:10.5851/kosfa.2014.34.1.88.

Oakley, E., J. Reinking, H. Sandige, I. Trehan, G. Kennedy, K. Maleta, and M. Manary. 2010. A ready-to-use therapeutic food containing 10% milk is less effective than one with 25% milk in the treatment of severely malnourished children. Journal of Nutrition 140:2248–2252. doi:10.3945/jn.110.123828.

Oconitrillo, M., J. Wickramasinghe, S. Omale, D. Beitz, and R. Appuhamy. 2024. Effects of elevating zinc supplementation on the health and production parameters of high-producing dairy cows. Animals 14:1–11. doi:10.3390/ani14030395.

Oltramari, C.E., M. da G. Pinheiro, M.S. de Miranda, J.R.P. Arcaro, L. Castelani, L.M. Toledo, L.A. Ambrósio, P.R. Leme, M.Q. Manella, and I. Arcaro Júnior. 2014. Selenium sources in the diet of dairy cows and their effects on milk production and quality, on udder health and on physiological indicators of heat stress. Ital J Anim Sci 13:48–52. doi:10.4081/ijas.2014.2921.

Orino, K. 2017. Inhibitory effect of transferrin on serum zinc measurement. BioMetals 30:615–621. doi:10.1007/s10534-017-0032-z.

Orino, K. 2020. Heme-binding ability of bovine milk proteins. BioMetals 33:287–291. doi:10.1007/s10534-020-00252-2.

O'Rourke, D. 2009. Nutrition and udder health in dairy cows: a review. Ir Vet J 62:15–20.

Ortman, K., and B. Pehrson. 1997. Selenite and Selenium Yeast as Feed Supplements for Dairy Cows. J. Vet. Med. 44:373–380.

Osorio, J.S., J. Lohakare, and M. Bionaz. 2016. Biosynthesis of milk fat, protein, and lactose: roles of transcriptional and posttranscriptional regulation. Physiol Genomics 48:231–256. doi:10.1152/physiolgenomics.00016.2015.-The.

de Paiva Ferreira, A.V., A. Cominotte, M.M. Ladeira, D.R. Casagrande, P.D. Teixeira, E. van Cleef, J. Ezequiel, P. Castagnino, and O.R. Machado Neto. 2020. Feedlot diets with soybean oil, selenium and vitamin E alters rumen metabolism and fatty acids content in steers. Anim Feed Sci Technol 260:114362. doi:10.1016/j.anifeedsci.2019.114362.

Pan, Y., Y. Wang, S. Lou, M. Wanapat, Z. Wang, W. Zhu, and F. Hou. 2021. Selenium supplementation improves nutrient intake and digestibility, and mitigates CH4 emissions from sheep grazed on the mixed pasture of alfalfa and tall fescue. J Anim Physiol Anim Nutr (Berl) 105:611–620. doi:10.1111/jpn.13495.

Panev, A., K. Hauptmanová, L. Pavlata, A. Pechová, J. Filípek, and R. Dvořák. 2013. Effect of supplementation of various selenium forms and doses on selected parameters of ruminal fluid and blood in sheep. Czech J. Anim. Sci 58:37–46.

Patel, B., N. Kumar, K. Prasad, V. Rajpoot, and S.S. Lathwal. 2021. Effect of zinc supplementation on physiological and oxidative stress status of peri-parturient Karan Fries cows during heat stress condition. J Entomol Zool Stud 9:444–447.

Pathak, A.K. 2008. Various factors affecting microbial protein synthesis in the. Vet World 1:186–189.

Patra, A.K., and J.R. Aschenbach. 2018. Ureases in the gastrointestinal tracts of ruminant and monogastric animals and their implication in urea-N/ammonia metabolism: A review. J Adv Res 13:39–50. doi:10.1016/j.jare.2018.02.005.

Pereira, A.M., M. de Lurdes Nunes Enes Dapkevicius, and A.E.S. Borba. 2022. Alternative pathways for hydrogen sink originated from the ruminal fermentation of carbohydrates: Which microorganisms are involved in lowering methane emission?. Anim Microbiome 4:5. doi:10.1186/s42523-021-00153-w.

Pereira, A.M., C. Pinna, G. Biagi, C. Stefanelli, M.R.G. Maia, E. Matos, M.A. Segundo, A.J.M. Fonseca, and A.R.J. Cabrita. 2020. Supplemental selenium source on gut health: Insights on fecal microbiome and fermentation products of growing puppies. FEMS Microbiol Ecol 96. doi:10.1093/femsec/fiaa212.

Perez, H.G., C.K. Stevenson, J.M. Lourenco, and T.R. Callaway. 2024. Understanding rumen microbiology: An overview. Encyclopedia 4:148–157. doi:10.3390/encyclopedia4010013.

Perignon, M., M. Fiorentino, K. Kuong, K. Burja, M. Parker, S. Sisokhom, C. Chamnan, J. Berger, and F.T. Wieringa. 2014. Stunting, poor iron status and parasite infection are significant risk factors for lower cognitive performance in Cambodian school-aged children. PLoS One 9. doi:10.1371/journal.pone.0112605.

Petrič, D., D. Mravčáková, K. Kucková, S. Kišidayová, A. Cieslak, M. Szumacher-Strabel, H. Huang, P. Kolodziejski, A. Lukomska, S. Slusarczyk, K. Čobanová, and Z. Váradyová. 2021. Impact of zinc and/or herbal mixture on ruminal fermentation, microbiota, and histopathology in lambs. Front Vet Sci 8:1–13. doi:10.3389/fvets.2021.630971.

Phipps, R.H., A.S. Grandison, A.K. Jones, D.T. Juniper, E. Ramos-Morales, and G. Bertin. 2008. Selenium supplementation of lactating dairy cows: Effects on milk production and total selenium content and speciation in blood, milk and cheese. Animal 2:1610–1618. doi:10.1017/S175173110800298X.

Pilachai, R., J.T. Schonewille, C. Thamrongyoswittayakul, S. Aiumlamai, C. Wachirapakorn, H. Everts, and W.H. Hendriks. 2012. The effects of high levels of rumen degradable protein on rumen pH and histamine concentrations in dairy cows. J Anim Physiol Anim Nutr (Berl) 96:206–213. doi:10.1111/j.1439-0396.2011.01139.x.

Pilarczyk, B., D. Jankowiak, A. Tomza-Marciniak, R. Pilarczyk, P. Sablik, R. Drozd, A. Tylkowska, and M. Skólmowska. 2012. Selenium concentration and glutathione peroxidase (GSH-Px) activity in serum of cows at different stages of lactation. Biol Trace Elem Res 147:91–96. doi:10.1007/s12011-011-9271-y.

Pinnell, L.J., A.A. Reyes, C.A. Wolfe, M.D. Weinroth, J.L. Metcalf, R.J. Delmore, K.E. Belk, P.S. Morley, and T.E. Engle. 2022. Bacteroidetes and Firmicutes drive differing microbial diversity and community composition among micro-environments in the bovine rumen. Front Vet Sci 9:1–12. doi:10.3389/fvets.2022.897996.

Pino, F., and A.J. Heinrichs. 2016. Effect of trace minerals and starch on digestibility and rumen fermentation in diets for dairy heifers. J Dairy Sci 99:2797–2810. doi:10.3168/jds.2015-10034.

Plummer, D.T. 1987. An Introduction to Practical Biochemistry. Third. Mc. Graw-Hill Book Company Ltd., New Delhi.

Pomastowski, P., M. Sprynskyy, and B. Buszewski. 2014. The study of zinc ions binding to casein. Colloids Surf B Biointerfaces 120:21–27. doi:10.1016/j.colsurfb.2014.03.009.

Prada, F.J.A., D.V. Macedo, and M.A.R. De Mello. 2007. Oxidative stress during rehabilitation from protein malnutrition associated with aerobic exercise in rats. Brazilian Archives of Biology and Technology 50:45–55.

Prince, K.A., and A. Laar. 2014. Nutritional status of school-age children in the Nkwanta South district-Volta region of Ghana. Eur Sci J 10:1857–7881.

Purcell, P.J., R.A. Law, A.W. Gordon, S.A. McGettrick, and C.P. Ferris. 2016. Effect of concentrate feeding method on the performance of dairy cows in early to mid lactation. J Dairy Sci 99:2811–2824. doi:10.3168/jds.2015-9988.

Qisthon, A., W. Busono, P. Surjowardojo, and Suyadi. 2020. The potential of the development of Holstein crossbreed dairy cows in tropical lowland Indonesia: Study of physiological and milk production by body cooling treatment. Indian J Anim Res 54:846–850. doi:10.18805/ijar.v0iOF.6992.

Qiu, Q., C. Gao, M.A. Ur Rahman, B. Cao, and H. Su. 2020. Digestive ability, physiological characteristics, and rumen bacterial community of holstein finishing steers in response to three nutrient density diets as fattening phases advanced. Microorganisms 8:335. doi:10.3390/microorganisms8030335.

Qu, D., P.P. Bo, Z.M. Li, and Y.S. Sun. 2024. Effects of whole nutritional formula foods on nutritional improvement and intestinal flora in malnourished rats. Food Sci Nutr 12:1724–1735. doi:10.1002/fsn3.3865.

Rabee, A.E., M.M.H. Khalil, G.A. Khadiga, A. Elmahdy, E.A. Sabra, M.A. Zommara, and I.M. Khattab. 2023. Response of rumen fermentation and microbiota to dietary supplementation of sodium selenite and bio-nanostructured selenium in lactating Barki sheep. BMC Vet Res 19:247. doi:10.1186/s12917-023-03799-7.

Ramiro-Puig, E., F.J. Pérez-Cano, C. Ramírez-Santana, C. Castellote, M. Izquierdo-Pulido, J. Permanyer, A. Franch, and M. Castell. 2007. Spleen lymphocyte function modulated by a cocoa-enriched diet. Clin Exp Immunol 149:535–542. doi:10.1111/j.1365-2249.2007.03430.x.

Ran, L., X. Wu, X. Shen, K. Zhang, and K. Huang. 2010. Effects of selenium form on blood and milk selenium concentrations, milk component and milk fatty acid composition in dairy cows. J. Sci. Food. Agric 90:2214–2219. doi:10.1002/jsfa.4073.

Razo-Rodriguez, O.E.D., J.E. Ramirez-Bribiesca, R. Lopez-Arellano, A.L. Revilla-Vazquez, S.S. Gonzalez-Munoz, M.A. Cobos-Peralta, L.M. Hernandez-Calva, and L.R. McDowell. 2013. Effects of dietary level of selenium and grain on digestive metabolism in lambs. Czech Journal of Animal Science 58:253–261. doi:10.17221/6823-cjas.

La Reau, A.J., J.P. Meier-Kolthoff, and G. Suen. 2016. Sequence-based analysis of the genus Ruminococcus resolves its phylogeny and reveals strong host association. Microb Genom 2:1–12. doi:10.1099/mgen.0.000099.

La Reau, A.J., and G. Suen. 2018. The Ruminococci: key symbionts of the gut ecosystem. Journal of Microbiology 56:199–208. doi:10.1007/s12275-018-8024-4.

Reid, M., M. O'Donovan, C.T. Elliott, J.S. Bailey, C.J. Watson, S.T.J. Lalor, B. Corrigan, M.A. Fenelon, and E. Lewis. 2015. The effect of dietary crude protein and phosphorus on grass-fed dairy cow production, nutrient status, and milk heat stability. J Dairy Sci 98:517–531. doi:10.3168/jds.2014-8437.

Reilly, C. 2006. Selenium in Food and Health. Second. Springer Science Media, New York, USA.

Renata, M., R.J. Agnieszka, W.I.Ę.S.Y.K. Edyta, and C. Marian. 2016. The influence of different chemical forms of selenium added to the diet including carnosic acid, fish oil and rapeseed oil on the formation of volatile fatty acids and methane in the rumen, and fatty acid profiles in the rumen content and muscles of lambs. Acta Vet Brno 66:373–391. doi:10.1515/acve-2016-0032.

Rerksuppaphol, S., and L. Rerksuppaphol. 2017. Zinc supplementation enhances linear growth in school-aged children: A randomized controlled trial. Pediatr Rep 9. doi:10.4081/pr.2017.7294.

Rizwan, M., K. Cheng, Y. Gang, Y. Hou, and C. Wang. 2024. Immunomodulatory effects of vitamin D and zinc on viral infection. Biol Trace Elem Res. doi:10.1007/s12011-024-04139-y.

Rizzo, A., E. Ceci, M. Pantaleo, M. Mutinati, M. Spedicato, G. Minoia, and R.L. Sciorsci. 2013. Evaluation of blood and milk oxidative status during early postpartum of dairy cows. Animal 7:118–123. doi:10.1017/S1751731112001048.

Rognes, T., T. Flouri, B. Nichols, C. Quince, and F. Mahé. 2016. VSEARCH: A versatile open source tool for metagenomics. PeerJ 2016:1–22. doi:10.7717/peerj.2584.

Roland, L., M. Drillich, and M. Iwersen. 2014. Hematology as a diagnostic tool in bovine medicine. Journal of Veterinary Diagnostic Investigation 26:592–598. doi:10.1177/1040638714546490.

Roohani, N., R. Hurrell, R. Kelishadi, and R. Schulin. 2013. Zinc and its importance for human health: An integrative review. Journal of Research in Medical Sciences 18:144–157.

Russell, J.B., J.D. O'Connor, D.G. Fox, P.J. Van Soest, and C.J. Sniffen. 1992. A net carbohydrate and protein system for evaluating cattle diets: I. Ruminal fermentation. J Anim Sci 70:3551–3561. doi:10.2527/1992.70113551x.

Russell, J.B., and D.B. Wilson. 1996. Why Are Ruminal Cellulolytic Bacteria Unable to Digest Cellulose at Low pH?. J Dairy Sci 79:1503–1509. doi:10.3168/jds.S0022-0302(96)76510-4.

Sahu, C., D.K. Dwivedi, and G.B. Jena. 2020. Zinc and selenium combination treatment protected diabetes-induced testicular and epididymal damage in rat. Hum Exp Toxicol 39:1235–1256. doi:10.1177/0960327120914963.

Salles, M.S. V, A.S. Netto, M.A. Zanetti, T.S.A. Samora, L.C.R. Junior, C.G. Lima, and F.A. Salles. 2022a. Milk biofortification through dietary supplementation of combined selenium, vitamin E and sunflower oil. Livest Sci 258:1–10. doi:10.1016/j.livsci.2022.104856.

Salles, M.S. V, A.S. Netto, M.A. Zanetti, T.S.A. Samora, L.C.R. Junior, C.G. Lima, and F.A. Salles. 2022b. Milk biofortification through dietary supplementation of combined selenium, vitamin E and sunflower oil. Livest Sci 258:1–10. doi:10.1016/j.livsci.2022.104856.

Sandri, M., C. Manfrin, A. Pallavicini, and B. Stefanon. 2014. Microbial biodiversity of the liquid fraction of rumen content from lactating cows. Animal 8:572–579. doi:10.1017/S1751731114000056.

Sandstead, H.H., and J.H. Freeland-Graves. 2014. Dietary phytate, zinc and hidden zinc deficiency. Journal of Trace Elements in Medicine and Biology 28:414–417. doi:10.1016/j.jtemb.2014.08.011.

Santoso, D., I.K. Sudiana, and M. Yunus. 2019. The effect of a low protein diet on the expression of IL-6, TNF-α and TGF-β in the kidney tissue of mice model. Malaysian Journal of Medicine and Health Science 15:46–52.

Sathe, A., and J.K. Cusick. 2022. Biochemistry, Immunoglobulin M. StatPearls Publishing, Treasure Island (FL).

Satter, L.D., and L.L. Slyter. 1974. Effect of ammonia concentration on rumen microbial protein production in vitro. British Journal of Nutrition 32:199–208. doi:https://doi.org/10.1079/BJN19740073.

Schrauzer, G.N. 2000. Recent advances in nutritional sciences selenomethionine : A review of its nutritional significance, metabolism and toxicity. Recent Advances in Nutritional Sciences 130:1653–1656.

Schrauzer, G.N. 2001. Nutritional Selenium Supplements: Product Types, Quality, and Safety. J Am Coll Nutr 20:1–4. doi:10.1080/07315724.2001.10719007.

Scott-Taylor, T.H., S.C. Axinia, S. Amin, and R. Pettengell. 2018. Immunoglobulin G; Structure and functional implications of different subclass modifications in initiation and resolution of allergy:. Immun Inflamm Dis 6:13–33. doi:10.1002/iid3.192.

Semaeva, E., O. Tenstad, J. Skavland, M. Enger, P.O. Iversen, B.T. Gjertsen, and H. Wiig. 2010. Access to the spleen microenvironment through lymph shows local cytokine production, increased cell flux, and altered signaling of immune cells during lipopolysaccharide-induced acute inflammation. The Journal of Immunology 184:4547–4556. doi:10.4049/jimmunol.0902049.

Senbanjo, I.O., K.A. Oshikoya, O.O. Odusanya, and O.F. Njokanma. 2011. Prevalence of and risk factors for stunting among school children and adolescents in Abeokuta, Southwest Nigeria. J. Health Popul. Nutr. 29:364–370.

Setiawan, H., and J. Nugraha. 2016. Analisis kadar IFN-γ dan IL-10 pada PBMC penderita tuberkulosis aktif, laten dan orang sehat, setelah di stimulasi dengan antigen EST-6. Jurnal Biosains Pascasarjana 18:50. doi:10.20473/jbp.v18i1.2016.50-63.

Shakweer, I.M.E. 2010. Effect of two different sources of zinc supplementation on productive performance of friesian dairy cows. Egyptian Journal of Animal Production 47:11–22. doi:10.21608/ejap.2010.94038.

Shankar, A.H., and A.S. Prasad. 1998. Zinc and immune function: the biological basis of altered resistance to infection. Am J Clin Nutr 8:447S-463S.

She, Y., Q. Huang, D. Li, and X. Piao. 2017. Effects of proteinate complex zinc on growth performance, hepatic and splenic trace elements concentrations, antioxidative function and immune functions in weaned piglets. Asian-Australas J Anim Sci 30:1160–1167. doi:10.5713/ajas.16.0867.

Shen, J., L. Zheng, X. Chen, X. Han, Y. Cao, and J. Yao. 2020. Metagenomic analyses of microbial and carbohydrate-active enzymes in the rumen of dairy goats fed different rumen degradable starch. Front Microbiol 11:1003. doi:10.3389/fmicb.2020.01003.

Shi, L., Y. Ren, C. Zhang, W. Yue, and F. Lei. 2017. Effects of maternal dietary selenium (Se-enriched yeast) on growth performance, antioxidant status and haemato-biochemical parameters of their male kids in Taihang Black Goats. Anim Feed Sci Technol 231:67–75. doi:10.1016/j.anifeedsci.2017.07.002.

Shi, L., W. Xun, W. Yue, C. Zhang, Y. Ren, Q. Liu, Q. Wang, and L. Shi. 2011. Effect of elemental nano-selenium on feed digestibility, rumen fermentation,

and purine derivatives in sheep. Anim Feed Sci Technol 163:136–142. doi:10.1016/j.anifeedsci.2010.10.016.

Siswoyo, P., M. Tafsin, and R. Handarini. 2018. Potential reproduction and response of selenium and zinc mineral supplementation on quality of goat samosir semen. Page in IOP Conference Series: Earth and Environmental Science. Institute of Physics Publishing.

Smith, K.L., J.S. Hogan, and W.P. Weiss. 1997. Dietary Vitamin E and Selenium Affect Mastitis and Milk Quality. J Anim Sci 75:1659–1665. doi:10.2527/1997.7561659x.

Snarska, A., D. Wysocka, L. Rytel, K. Zarczyńska, P. Sobiech, and S. Gonkowski. 2018. The influence of selenium and Vitamin E supplementation on cytological assessment of red blood cell line of bone marrow in fallow deer kept in captivity. Pol J Vet Sci 21:431–436. doi:10.24425/122614.

Sobhanirad, S., and A.A. Naserian. 2012. Effects of high dietary zinc concentration and zinc sources on hematology and biochemistry of blood serum in Holstein dairy cows. Anim Feed Sci Technol 177:242–246. doi:10.1016/j.anifeedsci.2012.06.007.

Van Soest, P.J., J.B. Robertson, and B.A. Lewis. 1991. Methods for dietary fiber, neutral detergent fiber, and nonstarch polysaccharides in relation to animal nutrition. J Dairy Sci 74:3583–3597. doi:10.3168/jds.S0022-0302(91)78551-2.

Son, A.R., M. Islam, S.H. Kim, S.S. Lee, and S.S. Lee. 2023. Influence of dietary organic trace minerals on enteric methane emissions and rumen microbiota of heat-stressed dairy steers. J Anim Sci Technol 65:132–148. doi:10.5187/jast.2022.e100.

Son, A.R., S.H. Kim, M. Islam, S.J. Oh, M.J. Paik, S.S. Lee, and S.S. Lee. 2022. Higher concentration of dietary selenium, zinc, and copper complex reduces heat stress-associated oxidative stress and metabolic alteration in the blood of Holstein and Jersey steers. Animals 12:1–16. doi:10.3390/ani12223104.

Song, Z.X., W.D. Jiang, Y. Liu, P. Wu, J. Jiang, X.Q. Zhou, S.Y. Kuang, L. Tang, W.N. Tang, Y.A. Zhang, and L. Feng. 2017. Dietary zinc deficiency reduced growth performance, intestinal immune and physical barrier functions related to NF-κB, TOR, Nrf2, JNK and MLCK signaling pathway of young grass carp (Ctenopharyngodon idella). Fish Shellfish Immunol 66:497–523. doi:10.1016/j.fsi.2017.05.048.

Sordillo, L.M. 2016. Nutritional strategies to optimize dairy cattle immunity. J Dairy Sci 99:4967–4982. doi:10.3168/jds.2015-10354.

Sordillo, L.M., and S.L. Aitken. 2009. Impact of oxidative stress on the health and immune function of dairy cattle. Vet Immunol Immunopathol 128:104–109. doi:10.1016/j.vetimm.2008.10.305.

Sordillo, L.M., and V. Mavangira. 2014. The nexus between nutrient metabolism, oxidative stress and inflammation in transition cows. Anim Prod Sci 54:1204–1214. doi:10.1071/AN14503.

Spears, J.W. 2003. Comparative Trace Element Nutrition Trace Mineral Bioavailability in Ruminants. J. Nutr. 133:1506S-1509S.

Spears, J.W., V.L.N. Brandao, and J. Heldt. 2022. INVITED REVIEW: Assessing trace mineral status in ruminants, and factors that affect measurements of trace mineral status. Applied Animal Science 38:252–267. doi:10.15232/aas.2021-02232.

Srinivas, S., and V. Prakash. 2011. Interaction of zn(ii) with bovine milk α-casein: Structure-function study. J Food Biochem 35:1311–1326. doi:10.1111/j.1745-4514.2010.00453.x.

Srivastava, M., A. Ranjan, J.K. Choudhary, M.K. Tripathi, S. Verma, V.K. Dixit, G. Nath, and A.K. Jain. 2014. Role of proinflammatory cytokines (Interferon Gamma) and anti-inflammatory cytokine (Interleukin-10) gene polymorphisms in chronic hepatitis B Infection: An Indian Scenario. Journal of Interferon and Cytokine Research 34:547–551. doi:10.1089/jir.2013.0054.

Stockdale, C.R., P.M. Shields, A. McKenna, G.P. Walker, F.R. Dunshea, and P.T. Doyle. 2011. Selenium levels in cows fed pasture and concentrates or a total mixed ration and supplemented with selenized yeast to produce milk with supra-nutritional selenium concentrations. J Dairy Sci 94:262–272. doi:10.3168/jds.2010-3590.

Strom, E., and E.R. Ørskov. 1983. The nutritive value of rumen micro-organisms in ruminants: 1. Large-scale isolation and chemical composition of rumen micro organisms. British Journal of Nutrition 50:463–470.

Strucken, E.M., Y.C.S.M. Laurenson, and G.A. Brockmann. 2015. Go with the flow-biology and genetics of the lactation cycle. Front Genet 6. doi:10.3389/fgene.2015.00118.

Su, X. 2021. Elucidating the beta-diversity of the microbiome: from global alignment to local alignment. mSystems 6:363–384. doi:10.1128/mSystems.

Sudikno, I.R. Irawan, B. Seyawati, Y.D. Sari, D.S. Puspitasari, Y. Widodo, F. Ahmadi, R. Rachmawati, N. Amaliah, P.P. Arfines, B.C. Rosha, J. Pamudi, Adianti, E.D. Jualianti, and A. Safitri. 2019. STUDI STATUS GIZI BALITA DI INDONESIA TAHUN 2019. Pusat Litbang Upaya Kesehatan Masyarakat, Badan Penelitian dan Pengembangan Kesehatan, Jakarta, Indonesia.

Sun, L., G. Liu, D. Xu, Z. Wu, L. Ma, S.F.M. Victoria, L.H. Baumgard, and D. Bu. 2021. Milk selenium content and speciation in response to supranutritional selenium yeast supplementation in cows. Animal Nutrition 7:1087–1094. doi:10.1016/j.aninu.2021.07.006.

Sun, L.L., S.T. Gao, K. Wang, J.C. Xu, M. V. Sanz-Fernandez, L.H. Baumgard, and D.P. Bu. 2019. Effects of source on bioavailability of selenium, antioxidant status, and performance in lactating dairy cows during oxidative stress-inducing conditions. J Dairy Sci 102:311–319. doi:10.3168/jds.2018-14974.

Sun, P., J. Wang, W. Liu, D.P. Bu, S.J. Liu, and K.Z. Zhang. 2017. Hydroxy-selenomethionine: A novel organic selenium source that improves antioxidant status and selenium concentrations in milk and plasma of mid-lactation dairy cows. J Dairy Sci 100:9602–9610. doi:10.3168/jds.2017-12610.

Sun, W., H. Shi, C. Gong, K. Liu, and G. Li. 2023. Effects of different yeast selenium levels on rumen fermentation parameters, digestive enzyme activity and gastrointestinal microflora of sika deer during antler growth. Microorganisms 1–16.

Sun, X., Q. Wang, Z. Yang, T. Xie, Z. Wang, S. Li, and W. Wang. 2022. Altering methane emission, fatty acid composition, and microbial profile during in vitro ruminant fermentation by manipulating dietary fatty acid ratios. Fermentation 8:1–18. doi:https://doi.org/10.3390/fermentation8070310.

Sun, Y., and J. Cheng. 2022. Hydrolysis of lignocellulosic materials for ethanol production: a review. Bioresour Technol 8:1–11. doi:https://doi.org/10.1016/S0960-8524(01)00212-7.

Sunarsih, E.S., Y.A. Dana, and C.M. Kumala. 2022. The combined effect of zinc and honey to increase hemoglobin and albumin levels in white rats induced by low protein diet. International Journal of Advances in Applied Sciences 11:296. doi:10.11591/ijaas.v11.i4.pp296-305.

Surai, P.F. 2006. Selenium in Nutrition and Health. Nottingham University Press, Nottingham.

Surai, P.F., I.I. Kochish, V.I. Fisinin, and D.T. Juniper. 2019. Revisiting oxidative stress and the use of organic selenium in dairy cow nutrition. Animals 9:1–25. doi:10.3390/ani9070462.

Szumacher-Strabel, M., and A. Cieślak. 2010. Potential of phytofactors to mitigate rumen ammonia and methane production. J Anim Feed Sci 19:319–337. doi:10.22358/jafs/66296/2010.

Takizawa, S., R. Asano, Y. Fukuda, M. Feng, Y. Baba, K. Abe, C. Tada, and Y. Nakai. 2020. Change of endoglucanase activity and rumen microbial community during biodegradation of cellulose using rumen microbiota. Front Microbiol 11:1–12. doi:10.3389/fmicb.2020.603818.

Tang, N., and L.H. Skibsted. 2016. Zinc bioavailability from whey. Enthalpy-entropy compensation in protein binding. Food Research International 89:749–755. doi:10.1016/j.foodres.2016.10.002.

Thomaz, M.C., P.H. Watanabe, L.A.F. Pascoal, M.M. Assis, U.S. Ruiz, A.B. Amorim, S.Z. Silva, V. V. Almeida, G.M.P. Melo, and R.A. Robles-Huaynate. 2015. Inorganic and organic trace mineral supplementation in weanling pig diets. An Acad Bras Cienc 87:1071–1081. doi:10.1590/0001-3765201520140154.

Tian, X., X. Wang, J. Li, Q. Luo, C. Ban, and Q. Lu. 2022a. The effects of selenium on rumen fermentation parameters and microbial metagenome in goats. Fermentation 8:1–13. doi:https://doi.org/10.3390/fermentation8050240.

Tian, Z., Y. Zhang, H. Zhang, Y. Sun, Y. Mao, Z. Yang, and M. Li. 2022b. Transcriptional regulation of milk fat synthesis in dairy cattle. J Funct Foods 96. doi:10.1016/j.jff.2022.105208.

Tilley, J.M.A., and R.A. Terry. 1963. A two-stage technique for the in vitro digestion of forage crops. Journal of the British Grassland Society 18:104–111. doi:http://dx.doi.org/10.1111/j.1365-2494.1963.tb00335.x.

Tinggi, U. 2008. Selenium: Its role as antioxidant in human health. Pages 102–108 in Environmental Health and Preventive Medicine.

Tizhe, E. V., I.O. Igbokwe, C.O. Njoku, M.Y. Fatihu, U.D. Tizhe, N.D.G. Ibrahim, E.S. Unanam, and R.M. Korzerzer. 2023. Effect of zinc supplementation on immunotoxicity induced by subchronic oral exposure to glyphosate-based herbicide (GOBARA®) in Wistar rats. Journal of International Medical Research 51. doi:10.1177/03000605221147188.

Tong, J., H. Zhang, D. Yang, Y. Zhang, B. Xiong, and L. Jiang. 2018. Illumina sequencing analysis of the ruminal microbiota in high-yield and low-yield lactating dairy cows. PLoS One 13:e0198225. doi:10.1371/journal.pone.0198225.

Trevisi, E., N. Jahan, G. Bertoni, A. Ferrari, and A. Minuti. 2015. Pro-inflammatory cytokine profile in dairy cows: Consequences for new lactation. Ital J Anim Sci 14:285–292. doi:10.4081/ijas.2015.3862.

Tufarelli, V., M.A. Colonna, C. Losacco, and N. Puvača. 2023. Biological health markers associated with oxidative stress in dairy cows during lactation period. Metabolites 13:1–12. doi:10.3390/metabo13030405.

Ullah, H., R.U. Khan, V. Tufarelli, and V. Laudadio. 2020. Selenium: An essential micronutrient for sustainable dairy cows production. Sustainability 12:1–11. doi:10.3390/su122410693.

UNICEF. 2022. Malnutrition in Children—UNICEF DATA. Accessed July 30, 2024. https://data.unicef.org/topic/nutrition/malnutrition/.

UNICEF-WHO-The World Bank. 2021. Joint Child Malnutrition Estimates (UNICEF-WHO-The World Bank)—2021—UNICEF DATA. Accessed August 2, 2024. https://data.unicef.org/resources/jme-report-2023/.

Untari, H.D., H. Wibawa, D.E. Waluyati, R. Dharmawan, B. Ariyadi, and C. Hanim. 2024. Effect of mineral premix addition to feed on performance of SAN laying hens. Page in IOP Conference Series: Earth and Environmental Science. Institute of Physics.

Urrutia, N., R. Bomberger, C. Matamoros, and K.J. Harvatine. 2019. Effect of dietary supplementation of sodium acetate and calcium butyrate on milk fat synthesis in lactating dairy cows. J Dairy Sci 102:5172–5181. doi:10.3168/jds.2018-16024.

Urrutia, N.L., and K.J. Harvatine. 2017. Acetate dose-dependently stimulates milk fat synthesis in lactating dairy cows. Journal of Nutrition 147:763–769. doi:10.3945/jn.116.245001.

Uyoyo Ukperoro, J., N. Offiah, T. Idris, and D. Awogoke. 2010. Antioxidant effect of zinc, selenium and their combination on the liver and kidney of alloxan-induced diabetes in rats. Med J Nutrition Metab 3:25–30. doi:10.1007/s12349-009-0069-9.

Vance, E.R., C.P. Ferris, C.T. Elliott, H.M. Hartley, and D.J. Kilpatrick. 2013. Comparison of the performance of Holstein-Friesian and Jersey×Holstein-Friesian crossbred dairy cows within three contrasting grassland-based systems of milk production. Livest Sci 151:66–79. doi:10.1016/j.livsci.2012.10.011.

Vanvalin, K.R., O.N. Genther-schroeder, R.N. Carmichael, C.P. Blank, E.L. Deters, S.J. Hartman, E.K. Niedermayer, S.B. Laudert, and S.L. Hansen. 2018. Influence of dietary zinc concentration and supplemental zinc source on nutrient digestibility, zinc absorption, and retention in sheep. J Anim Sci 96:5336–5344. doi:10.1093/jas/sky384.

Váradyová, Z., D. Mravčáková, M. Holodová, K. Čobanová, Ľ. Grešáková, J. Pisarčíková, M. Barszcz, M. Taciak, A. Tuśnio, and S. Kišidayová. 2018. Modulation of ruminal and intestinal fermentation by medicinal plants and zinc from different sources. J Anim Physiol Anim Nutr (Berl) 102:1–15. doi:10.1111/jpn.12940.

Vigh, A., A. Criste, K. Gragnic, L. Moquet, and C. Gerard. 2023. Ruminal solubility and bioavailability of inorganic trace mineral sources and effects on fermentation activity measured in vitro. Agriculture (Switzerland) 13:879. doi:10.3390/agriculture13040879.

Walker, G.P., F.R. Dunshea, J.W. Heard, C.R. Stockdale, and P.T. Doyle. 2010. Output of selenium in milk, urine, and feces is proportional to selenium intake in dairy cows fed a total mixed ration supplemented with selenium yeast. J Dairy Sci 93:4644–4650. doi:10.3168/jds.2010-3186.

Wallace, R.J., G.A. Broderick, L.M. Rode, N.D. Walker, J. Newbold, and J. Kopecny. 1997. Peptidases of the rumen bacterium, Prevotella ruminicola. Anaerobe 3:35–42. doi:10.1006/anae.1996.0065.

Wanapat, M., S. Foiklang, S. Sukjai, P. Tamkhonburi, N. Gunun, P. Gunun, K. Phesatcha, T. Norrapoke, and S. Kang. 2018. Feeding tropical dairy cattle with local protein and energy sources for sustainable production. J Appl Anim Res 46:232–236. doi:10.1080/09712119.2017.1288627.

Wanapat, M., and S. Khampa. 2007. Effect of Levels of Supplementation of Concentrate Containing High Levels of Cassava Chip on Rumen Ecology , Microbial N Supply and Digestibility of Nutrients in Beef Cattle. Asian-Australas J Anim Sci 20:75–81.

Wang, C., Q. Liu, W.Z. Yang, Q. Dong, X.M. Yang, D.C. He, P. Zhang, K.H. Dong, and Y.X. Huang. 2009. Effects of selenium yeast on rumen fermentation, lactation performance and feed digestibilities in lactating dairy cows. Livest Sci 126:239–244. doi:10.1016/j.livsci.2009.07.005.

Wang, C., Y.Z. Xu, L. Han, Q. Liu, G. Guo, W.J. Huo, J. Zhang, L. Chen, Y.L. Zhang, C.X. Pei, and S.L. Zhang. 2021a. Effects of zinc sulfate and coated zinc sulfate on lactation performance, nutrient digestion and rumen fermentation in Holstein dairy cows. Livest Sci 251:1–8. doi:10.1016/j.livsci.2021.104673.

Wang, D., D. Jia, R. He, S. Lian, J. Wang, and R. Wu. 2020a. Association between serum selenium level and subclinical mastitis in dairy cattle. Biol Trace Elem Res 198:1–8. doi:10.1007/s12011-020-02261-1.

Wang, F., N. Sun, H. Zeng, Y. Gao, N. Zhang, and W. Zhang. 2022. Selenium deficiency leads to inflammation, autophagy, endoplasmic reticulum stress, apoptosis and contraction abnormalities via affecting intestinal flora in intestinal smooth muscle of mice. Front Immunol 13:947655. doi:10.3389/fimmu.2022.947655.

Wang, H., M. Wang, J. Chen, Y. Tang, J. Dou, J. Yu, T. Xi, and C. Zhou. 2011. A polysaccharide from Strongylocentrotus nudus eggs protects against myelosuppression and immunosuppression in cyclophosphamide-treated mice. Int Immunopharmacol 11:1946–1953. doi:10.1016/j.intimp.2011.06.006.

Wang, K., X. Nan, K. Chu, J. Tong, L. Yang, S. Zheng, G. Zhao, L. Jiang, and B. Xiong. 2018a. Shifts of hydrogen metabolism from methanogenesis to propionate production in response to replacement of forage fiber with non-forage fiber sources in diets in vitro. Front Microbiol 9:2764. doi:10.3389/fmicb.2018.02764.

Wang, Q., Y. Zhang, N. Zheng, S. Zhao, S. Li, and J. Wang. 2020b. The biochemical and metabolic profiles of dairy cows with mycotoxins-contaminated diets. PeerJ 2020. doi:10.7717/peerj.8742.

Wang, R.L., J.G. Liang, L. Lu, L.Y. Zhang, S.F. Li, and X.G. Luo. 2013. Effect of zinc source on performance, zinc status , immune response, and rumen fermentation of lactating cows. Biol Trace Elem Res 152:16–24. doi:10.1007/s12011-012-9585-4.

Wang, S., J. Cheng, Y. Niu, P. Li, X. Zhang, and J. Lin. 2021b. Strategies for zinc uptake in Pseudomonas aeruginosa at the host–pathogen interface. Front Microbiol 12:741873. doi:10.3389/fmicb.2021.741873.

Wang, Y., R. Branicky, A. Noë, and S. Hekimi. 2018b. Superoxide dismutases: Dual roles in controlling ROS damage and regulating ROS signaling. Journal of Cell Biology 217:1915–1928. doi:10.1083/jcb.201708007.

Wang, Y., and T.A. McAllister. 2002a. Rumen microbes, enzymes and feed digestion-A review. Asian-Australasian Journal of Animal Sciences 15:1659–1676.

Wang, Y., and T.A. McAllister. 2002b. Rumen microbes, enzymes and feed digestion-A review. Asian-Australas J Anim Sci 15:1659–1676. doi:10.5713/ajas.2002.1659.

Wang, Z., Y. Tan, X. Cui, S. Chang, X. Xiao, T. Yan, H. Wang, and F. Hou. 2019. Effect of different levels of selenium yeast on the antioxidant status, nutrient digestibility, selenium balances and nitrogen metabolism of Tibetan sheep in the Qinghai-Tibetan Plateau. Small Ruminant Research 180:63–69. doi:10.1016/j.smallrumres.2019.10.001.

Wastney, M.E., G.F. Combs, W.K. Canfield, P.R. Taylor, K.Y. Patterson, A.D. Hill, J.E. Moler, and B.H. Patterson. 2011. A human model of selenium that integrates metabolism from selenite and selenomethionine. Journal of Nutrition 141:708–717. doi:10.3945/jn.110.129049.

Weatherburn, M.W. 1967. Phenol-Hypochlorite Reaction for Determination of Ammonia. Anal Chem 39:971–974.

Wei, J.Y., J. Wang, W. Liu, K.Z. Zhang, and P. Sun. 2019. Short communication: Effects of different selenium supplements on rumen fermentation and apparent nutrient and selenium digestibility of mid-lactation dairy cows. J Dairy Sci 102:3131–3135. doi:10.3168/jds.2018-15455.

Wei, W., Y. Zhen, Y. Wang, K. Shahzad, and M. Wang. 2022a. Advances of rumen functional bacteria and the application of micro-encapsulation fermentation technology in ruminants: A review. Fermentation 8:1–11. doi:10.3390/fermentation8100564.

Wei, X., K. Ouyang, T. Long, Z. Liu, Y. Li, and Q. Qiu. 2022b. Dynamic variations in rumen fermentation characteristics and bacterial community composition during in vitro fermentation. Fermentation 8:276. doi:10.3390/fermentation8060276.

Wei, Z., N. Zhou, L. Zou, Z. Shi, B. Dun, G. Ren, and Y. Yao. 2021. Soy protein alleviates malnutrition in weaning rats by regulating gut microbiota composition and serum metabolites. Front Nutr 8:1–16. doi:10.3389/fnut.2021.774203.

Weimer, P.J. 1996. Why don't ruminal bacteria digest cellulose faster?. J Dairy Sci 79:1496–1502. doi:10.3168/jds.S0022-0302(96)76509-8.

Weiss, W.P. 2005. Selenium Sources for Dairy Cattle. Nutrition 61–72.

Weiss, W.P. 2017. A 100-Year Review: From ascorbic acid to zinc—Mineral and vitamin nutrition of dairy cows. J Dairy Sci 100:10045–10060. doi:10.3168/jds.2017-12935.

Weiss, W.P., and J.S. Hogan. 2005. Effect of selenium source on selenium status, neutrophil function, and response to intramammary endotoxin challenge of dairy cows. J Dairy Sci 88:4366–4374. doi:10.3168/jds.S0022-0302(05)73123-4.

Widyobroto, B.P., S.P.S. Budhi, and A. Agus. 2010. Effect of protein undegraded supplementation on production and composition of milk in dairy cows. J Indones Trop Anim Agric 35:27–33. doi:https://doi.org/10.14710/jitaa.35.1.27-33.

Widyobroto, B.P., Rochijan, C.T. Noviandi, and A. Astuti. 2018. Dairy cows productivity and socio-economic profile of dairy smallholder's communities in Yogyakarta, Indonesia. IOP Conf Ser Earth Environ Sci 012060:0–6.

Widyobroto, B.P., Rochijan, C.T. Noviandi, and A. Astuti. 2019. Microenvironment identification and the feed availability for dairy cows during dry and wet seasons in the main dairy areas of Yogyakarta – Indonesia. Journal of Animal Behaviour and Biometeorology 7:86–91. doi:10.31893/2318-1265jabb.v7n2p86-91.

Witkowska, Z., I. Michalak, and M. Korczy. 2015. Biofortification of milk and cheese with microelements by dietary feed bio-preparations. Journal Food Science Technology 52:6484–6492. doi:10.1007/s13197-014-1696-9.

Wood, D., and G.F. Quiroz-Rocha. 2010. Normal hematology of cattle. 6th ed. D.J. Weiss and K.J. Wardrop, ed. Wiley-Blackwell, Ames, IA.

World Health Organization. 2015. Stunting in a Nutshell. Accessed August 2, 2024. https://www.who.int/news/item/19-11-2015-stunting-in-a-nutshell.

Wu, G. 2018. Principles of Animal Nutrition. 1st ed. Taylor & Francis Group, Boca Raton, FL, USA.

Wu, X., S. Huang, J. Huang, P. Peng, Y. Liu, B. Han, and D. Sun. 2021. Identification of the potential role of the rumen microbiome in milk protein and fat synthesis in dairy cows using metagenomic sequencing. Animals 11:1247. doi:10.3390/ani11051247.

Xia, C., M.A.U. Rahman, H. Yang, T. Shao, Q. Qiu, H. Su, and B. Cao. 2018. Effect of increased dietary crude protein levels on production performance, nitrogen utilisation, blood metabolites and ruminal fermentation of Holstein bulls. Asian-Australas J Anim Sci 31:1643–1653. doi:10.5713/ajas.18.0125.

Xiao, M., Y. Wang, M. Wei, W. Peng, Y. Wang, R. Zhang, Y. Zheng, J. Ju, C. Dong, L. Du, and M. Bao. 2024. Effects of nanoselenium on the performance, blood indices, and milk metabolites of dairy cows during the peak lactation period. Front Vet Sci 11:1418165. doi:10.3389/fvets.2024.1418165.

Xu, N.N., D.T. Yang, C. Miao, T.G. Valencak, J.X. Liu, and D.X. Ren. 2021. Organic zinc supplementation in early-lactation dairy cows and its effects on zinc content and distribution in milk and cheese dairy cows and its effects on zinc content and. JDS Communications 2:110–113. doi:10.3168/jdsc.2020-0070.

Xue, M.Y., H.Z. Sun, X.H. Wu, J.X. Liu, and L.L. Guan. 2020. Multi-omics reveals that the rumen microbiome and its metabolome together with the host metabolome contribute to individualized dairy cow performance. Microbiome 8:1–19. doi:10.1186/s40168-020-00819-8.

Yan, G., Z. Shi, and H. Li. 2021. Critical temperature-humidity index thresholds based on surface temperature for lactating dairy cows in a temperate climate. Agriculture (Switzerland) 11:970. doi:10.3390/agriculture11100970.

Yan, H., and H. Chang. 2012a. Antioxidant and antitumor activities of selenium- and zinc-enriched oyster mushroom in mice. Biol Trace Elem Res 150:236–241. doi:10.1007/s12011-012-9454-1.

Yan, H., and H. Chang. 2012b. Antioxidant and antitumor activities of selenium- and zinc-enriched oyster mushroom in mice. Biol Trace Elem Res 150:236–241. doi:10.1007/s12011-012-9454-1.

Yáñez-Ruiz, D.R., L. Abecia, and C.J. Newbold. 2015. Manipulating rumen microbiome and fermentation through interventions during early life: A review. Front Microbiol 6:1–12. doi:10.3389/fmicb.2015.01133.

Yang, C., G. Tsedan, Y. Liu, and F. Hou. 2020. Shrub coverage alters the rumen bacterial community of yaks (Bos grunniens) grazing in alpine meadows. J Anim Sci Technol 62:504–520. doi:10.5187/JAST.2020.62.4.504.

Yang, Q., L. Qian, S. He, and C. Zhang. 2024a. Hesperidin alleviates zinc-induced nephrotoxicity via the gut-kidney axis in swine. Front Cell Infect Microbiol 14:1390104. doi:10.3389/fcimb.2024.1390104.

Yang, Z., L. Bao, W. Song, X. Zhao, H. Liang, M. Yu, and M. Qu. 2024b. Nicotinic acid changes rumen fermentation and apparent nutrient digestibility by regulating rumen microbiota in Xiangzhong black cattle. Anim Biosci 37:240–252. doi:10.5713/ab.23.0149.

Yildiz, A., Y. Kaya, and O. Tanriverdi. 2019. Effect of the interaction between selenium and zinc on DNA repair in association with cancer prevention. J Cancer Prev 24:146–154. doi:10.15430/jcp.2019.24.3.146.

Yost, W.M., J.W. Young, S.P. Schmidt, and A.D. Mcgilliard. 1977. Gluconeogenesis in ruminants: Propionic acid production from a high-grain diet fed to cattle. J. Nutr 107:2036–2043.

Yusuf, S., Y. Soenarto, M. Juffrie, and W. Lestariana. 2019. The effect of zinc supplementation on pro-inflammatory cytokines (TNF-α , IL-1 AND IL-6) in mice with Escherichia coli LPS-induced diarrhea 11:412–418.

Zaboli, K.H., and H. Aliarabi. 2013. Effect of different levels of zinc oxide nano particles and zinc oxide on some ruminal parameters by in vitro and in vivo methods. Animal Production Reseacrh 2:1–14.

Zanferari, F., T.H.A. Vendramini, M.F. Rentas, R. Gardinal, G.D. Calomeni, L.G. Mesquita, C.S. Takiya, and F.P. Rennó. 2018. Effects of chitosan and whole raw soybeans on ruminal fermentation and bacterial populations, and milk fatty acid profile in dairy cows. J Dairy Sci 101:10939–10952. doi:10.3168/jds.2018-14675.

Zavros, A., E. Andreou, G. Aphamis, G.C. Bogdanis, G.K. Sakkas, Z. Roupa, and C.D. Giannaki. 2023. The effects of zinc and selenium co-supplementation on resting metabolic rate, thyroid function, physical fitness, and functional capacity in overweight and obese people under a hypocaloric diet: A randomized, double-blind, and placebo-controlled trial. Nutrients 15:3133. doi:10.3390/nu15143133.

Zhang, G.W., C. Wang, H.S. Du, Z.Z. Wu, Q. Liu, G. Guo, W.J. Huo, J. Zhang, Y.L. Zhang, C.X. Pei, and S.L. Zhang. 2020a. Effects of folic acid and sodium selenite on growth performance, nutrient digestion, ruminal fermentation and urinary excretion of purine derivatives in Holstein dairy calves. Livest Sci 231:1–7. doi:10.1016/j.livsci.2019.103884.

Zhang, J., S. Gao, H. Li, M. Cao, W. Li, and X. Liu. 2021a. Immunomodulatory effects of selenium-enriched peptides from soybean in cyclophosphamide-induced immunosuppressed mice. Food Sci Nutr 9:6322–6334. doi:10.1002/fsn3.2594.

Zhang, R., M. Wei, J. Zhou, Z. Yang, M. Xiao, L. Du, M. Bao, J. Ju, C. Dong, Y. Zheng, and H. Bao. 2024. Effects of organic trace minerals chelated with oligosaccharides on growth performance, blood parameters, slaughter performance and meat quality in sheep. Front Vet Sci 11:1366314. doi:10.3389/fvets.2024.1366314.

Zhang, T.T., G.Y. Zhao, W.S. Zheng, W.J. Niu, C. Wei, and S.X. Lin. 2015. Effects of rare earth element lanthanum on rumen methane and volatile fatty acid production and microbial flora in vitro. J Anim Physiol Anim Nutr (Berl) 99:442–448. doi:10.1111/jpn.12251.

Zhang, X., L. Zhang, K. Xia, J. Dai, and J. Huang. 2022. Effects of dietary selenium on immune function of spleen in mice. J Funct Foods 89:104914. doi:10.1016/j.jff.2021.104914.

Zhang, Y.K., X.X. Zhang, F.D. Li, C. Li, G.Z. Li, D.Y. Zhang, Q.Z. Song, X.L. Li, Y. Zhao, and W.M. Wang. 2021b. Characterization of the rumen microbiota and its relationship with residual feed intake in sheep. Animal 15:11. doi:10.1016/j.animal.2020.100161.

Zhang, Z.D., C. Wang, H.S. Du, Q. Liu, G. Guo, W.J. Huo, J. Zhang, Y.L. Zhang, C.X. Pei, and S.L. Zhang. 2020b. Effects of sodium selenite and coated sodium selenite on lactation performance, total tract nutrient digestion and rumen fermentation in Holstein dairy cows. Animal 14:2091–2099. doi:10.1017/S1751731120000804.

Zhao, N., X. Wang, Y. Zhang, Q. Gu, F. Huang, W. Zheng, and Z. Li. 2013. Gestational zinc deficiency impairs humoral and cellular immune responses to hepatitis B vaccination in offspring mice. PLoS One 8:e73461. doi:10.1371/journal.pone.0073461.

Zhao, W., M.M. Abdelsattar, X. Wang, N. Zhang, and J. Chai. 2023. In vitro modulation of rumen fermentation by microbiota from the recombination of rumen fluid and solid phases. Microbiol Spectr 11:1–18. doi:10.1128/spectrum.03387-22.

Zhao, X., Y. Zhang, A. Rahman, M. Chen, N. Li, T. Wu, Y. Qi, N. Zheng, S. Zhao, and J. Wang. 2024. Rumen microbiota succession throughout the perinatal period and its association with postpartum production traits in dairy cows: A review. Animal Nutrition 18:17–26. doi:10.1016/j.aninu.2024.04.013.

Zhao, X.H., S. Zhou, L.B. Bao, X.Z. Song, K.H. Ouyang, L.J. Xu, K. Pan, C.J. Liu, and M.R. Qu. 2018. Response of rumen bacterial diversity and fermentation parameters in beef cattle to diets containing supplemental daidzein. Ital J Anim Sci 17:643–649. doi:10.1080/1828051X.2017.1404943.

Zhao, X.J., Z.P. Li, J.H. Wang, X.M. Xing, Z.Y. Wang, L. Wang, and Z.H. Wang. 2015. Effects of chelated Zn/Cu/Mn on redox status, immune responses and hoof health in lactating Holstein cows. J Vet Sci 16:439–446. doi:10.4142/jvs.2015.16.4.439.

Zheng, Y., T. He, T. Xie, J. Wang, Z. Yang, X. Sun, W. Wang, and S. Li. 2022. Hydroxy-selenomethionine supplementation promotes the in vitro rumen fermentation of dairy cows by altering the relative abundance of rumen microorganisms. J Appl Microbiol 132:2583–2593. doi:10.1111/jam.15392.

Zhong, R.Z., J.G. Li, Y.X. Gao, Z.L. Tan, and G.P. Ren. 2008. Effects of substitution of different levels of steam-flaked corn for finely ground corn on lactation and digestion in early lactation dairy cows. J Dairy Sci 91:3931–3937. doi:10.3168/jds.2007-0957.

Zhou, M., L. Xu, F. Zhao, and H. Liu. 2021. Regulation of milk protein synthesis by free and peptide-bound amino acids in dairy cows. Biology (Basel) 10:1044. doi:10.3390/biology10101044.

Zhou, X., Y. Ma, C. Yang, Z. Zhao, Y. Ding, Y. Zhang, P. Wang, L. Zhao, C. Li, Z. Su, X. Wang, W. Ming, L. Zeng, and X. Kang. 2023. Rumen and fecal microbiota characteristics of Qinchuan cattle with divergent residual feed intake. Microorganisms 11:358. doi:10.3390/microorganisms11020358.

Zhu, W.Y., A.H. Kingston-Smith, D. Troncoso, R.J. Merry, D.R. Davies, G. Pichard, H. Thomas, and M.K. Theodorou. 1999. Evidence of a role for plant proteases

in the degradation of herbage proteins in the rumen of grazing cattle. J Dairy Sci 82:2651–2658. doi:10.3168/jds.S0022-0302(99)75522-0.

Zigo, F., Z. Farkašóvá, J. Elečko, M. Lapin, M. Chripková, and A. Czerski. 2014. Effect of parenteral administration of Selenium and vitamin e on health status of mammary gland and on selected antioxidant indexes in blood of dairy cows. Pol J Vet Sci 17:217–223. doi:10.2478/pjvs-2014-0031.