动物营养学报
CHINESE JOURNAL OF ANIMAL NUTRITION

动物营养学报 » 2013, Vol. 25 » Issue (4) :768-777 DOI: 10.3969/j.issn.1006-267x.2013.04.014

苯甲酸对断奶仔猪生长性能、血清生化指标、养分消化率和空肠食糜消化酶活性的影响

刁慧, 郑萍, 余冰, 何军, 毛湘冰, 虞洁, 黄志清, 代腊, 王曲圆, 陈代文

四川农业大学动物营养研究所, 动物抗病营养教育部重点实验室, 雅安 625014

Effects of Benzoic Acid on Growth Performance, Serum Biochemical Parameters, Nutrient Digestibility and Digestive Enzyme Activities of Jejunal Digesta in Weaner Piglets

DIAO Hui, ZHENG Ping, YU Bing, HE Jun, MAO Xiangbing, YU Jie, HUANG Zhiqing, DAI La, WANG Quyuan, CHEN Daiwen

Key Laboratory for Animal Disease-Resistance Nutrition of Ministry of Education, Institute of Animal Nutrition, Sichuan Agricultural University, Ya'an 625014, China

摘要 本试验旨在研究苯甲酸对断奶仔猪生长性能、血清生化指标、养分消化率和空肠食糜消化酶活性的影响。选择72头24日龄断奶、初始体重为(6.03±0.78) kg的健康"杜×长×大"三元杂交仔猪,按体重相近、公母各占1/2的原则,随机分为2个组,即对照组和苯甲酸组(5 000 mg/kg),每个组6个重复,每个重复6头仔猪,试验期42 d。结果表明:与对照组相比,饲粮中添加5 000 mg/kg苯甲酸显著降低了仔猪全期的料重比(*P*<0.05),显著或极显著提高了试验第42天仔猪血清中钙和三碘甲腺原氨酸的含量以及饲粮干物质、粗蛋白质、能量、粗脂肪、钙、磷和粗灰分的消化率(*P*<0.05或*P*<0.01)。与对照组相比,饲粮中添加5 000 mg/kg苯甲酸显著或极显著提高了试验第14天仔猪空肠食糜胰蛋白酶、淀粉酶、脂肪酶、麦芽糖酶、蔗糖酶和乳糖酶的活性及试验第42天仔猪空肠食糜乳糖酶和蔗糖酶的活性(*P*<0.05或*P*<0.01)。综上所述,在本试验条件下,添加5 000 mg/kg苯甲酸可以提高断奶仔猪生长性能、养分消化率和空肠食糜消化酶活性,并在一定程度上改善血清生化指标。

关键词: 苯甲酸 生长性能 养分消化率 消化酶活性 仔猪

Abstract: This experiment was conducted to investigate the effects of dietary benzoic acid on the growth performance, serum biochemical parameters, nutrient digestibility and digestive enzyme activities of jejunal digesta in weaner piglets. A total of 72 healthy weaner piglets (Duroc譮andrace譮orkshire, weaned at 24 days of age) with an initial body weight of (6.03?0.78) kg were randomly divided into 2 groups with 6 replicates (pens) per group and 6 piglets per pen. The piglets were fed a basal diet (control group) and the basal diet+5 000 mg/kg benzoic acid (benzoic acid group), respectively. The whole trial lasted for 42 days. The results showed as follows: compared with the control group, diets supplemented with 5 000 mg/kg benzoic acid significantly decreased the feed/gain during the whole trial period (*P*<0.05), and significantly increased calcium and triothyrone contents in serum on day 42 and the digestibility of dry matter, crude protein, ether extract, calcium, phosphorus, energy and ash (*P*<0.05 or *P*<0.01). Compared with the control group, diets supplemented with 5 000 mg/kg benzoic acid significantly increased the activities of trypsin, lipase, amylase, maltase, sucrase and lactase of digesta in jejunum on day 14 and activities of lactase and sucrase of digesta in jejunum on day 42 (*P*<0.05 or *P*<0.01). In conclusion, diets supplemented with 5 000 mg/kg benzoic acid can improve the growth performance, serum biochemical parameters, nutrient digestibility and digestive enzyme activities of digesta in jejunum of piglets.

Keywords: benzoic acid, growth performance, nutrient digestibility, digestive enzyme activities, piglets

收稿日期: 2012-11-21;

基金资助:

国家生猪现代产业技术体系建设专项资金(CARS-36);生猪现代产业链关键技术研究集成与产业化示范(2012NZ001)

通讯作者 陈代文,教授,博士生导师,E-mail:dwchen@sicau.edu.cn

刁慧, 郑萍, 余冰等 . 苯甲酸对断奶仔猪生长性能、血清生化指标、养分消化率和空肠食糜消化酶活性的影响[J]. 动物营养学报, 2013,V25(4): 768-777

DIAO Hui, ZHENG Ping, YU Bing etc . Effects of Benzoic Acid on Growth Performance, Serum Biochemical Parameters, Nutrient Digestibility and Digestive Enzyme Activities of Jejunal Digesta in Weaner Piglets[J]. Chinese Journal of Animal Nutrition, 2013,V25(4): 768-777.

链接本文:

http://118.145.16.228/Jweb_dwyy/CN/10.3969/j.issn.1006-267x.2013.04.014 或 http://118.145.16.228/Jweb_dwyy/CN/Y2013/V25/I4/768

[1] ZDZISLAW M.Organic acids as potential alternatives to antibiotic growth promoters for pigs[J].Advances in Pork Production,2005,16:169-182.

[2] KIRSI H P,ZDZISLAW M.Organic acids for performance enhancement in pig diets[J].Nutrition Research Reviews,1999,12:117-145.

[3] TSILOYIANNIS V K,KYRIAKIS S C,VLEMMAS J,et al.The effect of organic acids on the control of porcine post-weaning diarrhea[J].Research in Veterinary Science,2001,70:287-293.

[4] KASPROWICZ P M,FRANKIEWICZ A,SELWET M,et al.Effect of salts and organic acids on metabolite production and microbial parameters of piglets' digestive tract[J].Livestock Science,2009,126:310-313.

[5] TSILOYIANNIS V K,KYRIAKIS S C,VLEMMAS J.The effect of organic acids on the control of post-weaning oedema disease of piglets [J].Research in Veterinary Science,2001,70:281-285.

[6] GUGGENBUHI P,SÉON A,PIÑÓN A,et al.Effects of dietary supplementation with benzoic acid (Vevo Vitall®) on the zootechnical performance,the gastrointestinal microflora and the ileal digestibility of the young pig[J].Livestock Science,2007,108:218-221.

[7] KATHRIN B.Benzoic acid as feed additive in pig nutrition:effects of diet composition on performance,digestion and ecological aspects.Ph.D.Thesis.Zurich:The Eidgenoessische Technische Hochschule Zuerich,2009:39-43.

[8] 蔡锐芳,李鹏,张亚智,等.苯甲酸对断奶仔猪生长性能的影响[J].当代畜牧,2011(5):34-35.

[9] TORRALLARDONA D,BADIOLA I,BROZ J.Effects of benzoic acid on performance and ecology of gastrointestinal microbiota in weanling piglets [J].Livestock Science,2007,108:210-213.

[10] 张丽英.饲料分析及饲料质量检测技术[M].北京:中国农业大学出版社,2003.

[11] HALAS D,HANSEN C F,HAMPSON D J,et al.Dietary supplementation with benzoic acid improves apparent ileal digestibility of total nitrogen and increases villous height and caecal microbial diversity in weaner pigs[J].Animal Feed Science and Technology,2010,160:137-147.

[12] KLUGE H,BROZ J,EDER K.Effect of benzoic acid on growth performance,nutrient digestibility,nitrogen balance,gastrointestinal microflora and parameters of microbial metabolism in piglets[J].Journal of Animal Physiology and Animal Nutrition,2006,90:316-324.

[13] PAPATSIROS V G,TASSIS P D,TZIKA E D,et al.Effect of benzoic acid and combination of benzoic acid with a probiotic containing *Bacillus Cereus* var.toyoi in weaned pig nutrition[J].Polish Journal of Veterinary Sciences,2011,14:117-125.

[14] 程金荣.不同有机酸对广西飞凤土鸡营养物质代谢、血液理化指标及肠道微生态效应的影响.硕士学位论文.南宁:广西大学,2006:20-33.

[15] GUTZWILLER A,HESS H D,ADAM A.Effects of a reduced calcium,phosphorus and protein intake and of benzoic acid on calcium and phosphorus metabolism of growing pigs[J].Animal Feed Science and Technology,2011,168:113-121.

[16] LI Z J,YI G F,YIN J D,et al.Effects of organic acids on growth performance,gastrointestinal pH,intestinal microbial populations and immune responses of weaned pigs[J].Journal of Asian-Australian Animal Science,2008,21(2):252-261.

[17] 孙喜伟.酸化剂对雪山鸡种鸡繁殖性能和血液生化指标的影响研究.硕士学位论文.合肥:安徽农业大学,2009:24-26.

[18] PAPADOMICHELAKIS G,MOUNTZOURIS K C,ZOIDIS E.Influence of dietary benzoic acid addition on nutrient digestibility and selected biochemical parameters in fattening rabbits[J].Animal Feed Science and Technology,2011,163:207-213.

[19] KLUGE H,BROZ J,EDER K.Effects of dietary benzoic acid on urinary pH and nutrient digestibility in lactating sows[J].Livestock Science,2010,134:119-121.

[20] GIANLUCA G,LUCA M,STEFANIA C,et al.Effects of benzoic acid on nitrogen,phosphorus and energy balance and on ammonia emission from slurries in the heavy pig[J].Italian Journal of Animal Science,2011,10:e38.

[21] 晏家友.缓释复合酸化剂对断奶仔猪消化道酸度及肠道形态和功能的影响.硕士学位论文.雅安:四川农业大学,2009:18-20.

[22] RISLEY C R,KORNEGAY E T,LINDEMANN M D.Effeets of organic acids with and without a microbial culture on performance and gastrointestinal tract measurements of weanling pigs[J].Animal Feed Science and Technology,1991,35:259-270.

[1] 吕凯, 侯生珍, 王志有, 郭远玉, 梁晓兵.饲粮蛋白质水平及赖氨酸/蛋氨酸对早期断奶藏羔羊生长性能及胃肠道组织形态的影响[J]. 动物营养学报, 2013,25(4): 743-751

[2] 张文旭, 王宝维, 葛文华, 张名爱, 李文立.饲粮添加胆碱对鹅生长性能、屠宰性能及养分表观利用率的影响[J]. 动物营养学报, 2013,25(4): 778-784

[3] 杨奇慧, 谭北平, 董晓慧, 迟淑艳, 刘泓宇, 王凤美.铬对凡纳滨对虾生长性能、血清生化指标及非特异性免疫酶活性的影响[J]. 动物营养学报, 2013,25(4): 795-804

[4] 于会民, 梁陈冲, 陈宝江, 蔡辉益, 王勇, 刘世杰.黄曲霉毒素解毒酶制剂对饲喂黄曲霉毒素B_1饲粮的断奶仔猪生长性能及肝脏生化指标的影响[J]. 动物营养学报, 2013,25(4): 805-811

[5] 许丽惠, 祁瑞雪, 王长康, 王全溪, 谢丽曲, 林丽花, 陈庆达.发酵豆粕对黄羽肉鸡生长性能、血清生化指标、肠道黏膜免疫功能及微生物菌群的影响[J]. 动物营养学报, 2013,25(4): 840-848

[6] 许明珠, 张琴, 童万平, 董兰芳, 童潼, 程光平, 黄国强, 蒋艳.饲料糖水平对方格星虫稚虫生长、体组成和消化酶活性的影响[J]. 动物营养学报, 2013,25(3): 534-542

[7] 任殿付, 李福昌, 王雪鹏, 王春阳, 吴振宇.饲粮中性洗涤纤维水平对断奶至3月龄獭兔生长性能、氮代谢、毛皮品质和盲肠发酵的影响[J]. 动物营养学报, 2013,25(3): 543-549

[8] 赵珩伊, 余冰, 毛湘冰, 何军, 郑萍, 黄志清, 韩国全, 虞洁, 陈代文.水合硅铝酸钠钙对生长肥育猪生长性能、养分表观消化率及抗氧化能力的影响[J]. 动物营养学报, 2013,25(3): 571-578

[9] 谷娟, 许丛丛, 蔡旋, 杨守凤, 祁亮, 徐建雄.复合多肽对早期断奶仔猪生长性能、血液理化指标和肠道主要菌群数量的影响[J]. 动物营养学报, 2013,25(3): 579-586

[10] 杨侃侃, 边连全, 刘显军, 韩杰, 张飞.刺五加多糖对断奶仔猪生长性能、血清免疫指标及粪便微生物菌群的影响[J]. 动物营养学报, 2013,25(3): 628-634

[11] 黄金凤, 赵志刚, 罗亮, 徐奇友.水温和饲料蛋白质水平对松浦镜鲤幼鱼肠道消化酶活性的影响[J]. 动物营养学报, 2013,25(3): 651-660

[12] 詹黎明, 郭吉余, 吴德.乳清浓缩蛋白在仔猪生产中的应用及其作用机理[J]. 动物营养学报, 2013,25(2): 275-280

[13] 杨桂芹, 韩钰婧, 张文克, 刘国华, 郑爱娟.饲粮代谢能和可消化赖氨酸水平对21～42日龄肉仔鸡生长性能及血清生化指标的影响[J]. 动物营养学报, 2013,25(2): 281-288

[14] 李忠荣, 陈婉如, 叶鼎承, 林滉, 刘景.低蛋白质补充氨基酸饲粮对北京鸭生长性能、血清生化指标及粪氮含量的影响[J]. 动物营养学报, 2013,25(2): 319-325

[15] 洪平, 蒋守群, 周桂莲, 蒋宗勇, 林映才, 郑春田, 陈芳.43～63日龄黄羽肉鸡钙需要量研究[J]. 动物营养学报, 2013,25(2): 299-309