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动物营养专题

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学术文献

1．Branched-chain amino acids regulate intracellular protein turnover in porcine mammary epithelial cells(支链氨基酸调节猪乳腺上皮细胞内蛋白质的周转)

简介：Dietary supplementation with branched-chain amino acids (BCAAs) to lactating sows has been reported to enhance their milk production, but the underlying mechanisms remain largely unknown. This study was conducted with porcine mammary epithelial cells (PMECs) to test the hypothesis that individual BCAAs or their mixture stimulates protein synthesis and inhibit proteolysis in PMECs. Cells were cultured at 37 °C in customized Dulbecco's modified Eagle medium containing 5 mmol/L D-glucose, 1 mmol/L L-phenylalanine, L-[ring-2,4-3H]phenylalanine, 0.1 (control), 0.25, 0.5, 1, or 2 mmol/L L-leucine, L-isoleucine or L-valine or an equimolar mixture of the three BCAAs. The culture medium also contained physiological concentrations of other amino acids found in the plasma of lactating sows. Proliferation, protein synthesis, proteolysis, β-casein production, the mechanistic target of rapamycin (mTOR) signaling, and the ubiquitin-proteasome pathway were determined for PMECs. Cell proliferation and abundances of phosphorylated mTOR, eukaryotic translation initiation factor 4E-binding protein 1, and ribosomal protein S6 kinase β-1 proteins increased (P < 0.05), but abundances of ubiquitinated protein and 20S proteasome decreased (P < 0.05) when extracellular concentrations of L-leucine, L-isoleucine, L-valine, or an equimolar mixture of BCAAs were increased from 0.1 to 2 mmol/L. Compared with the control, 0.25, 0.5, 1 or 2 mmol/L BCAAs enhanced (P < 0.01) protein (including β-casein) synthesis, while decreasing (P < 0.05) proteolysis in PMECs in a dose-dependent manner. Collectively, our results indicate that physiological concentrations of BCAAs regulate protein turnover in mammary epithelial cells to favor net protein synthesis through stimulating the mTOR signaling pathway and inhibiting the ubiquitin-proteasome pathway.

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2．改善早期断奶仔猪肠道健康和功能的营养策略研究进展

简介：商业化生产中仔猪早期断奶（3～4周龄）恰是肠道功能发育的关键时期，断奶应激带来的持续性肠道屏障功能损伤是断奶仔猪细菌性和病毒性肠炎及断奶后腹泻的主要诱因。饲料端“禁抗”背景下，运用营养策略改善早期断奶仔猪肠道功能的研究是研究者关注的焦点问题。从早期断奶对仔猪肠道屏障功能的影响及多种营养策略对断奶仔猪肠道功能改善的作用，综述了早期断奶致仔猪肠道屏障功能损伤的机理及氨基酸、抗菌肽、益生菌、膳食纤维、低聚糖、有机酸、微量营养素和脂质营养等营养策略改善仔猪肠道功能的作用机制，为通过营养策略改善断奶仔猪肠道功能相关研究提供参考。

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3．复合益生菌对大肠杆菌的抑菌性能及在断奶仔猪上的应用研究

简介：试验旨在研究复合益生菌抑菌效果以及对断奶仔猪生长性能、胃肠道pH和肠道菌群的影响。采用打孔法证实复合益生菌对被试5株大肠杆菌均具有抑菌效果，共培养法证实复合益生菌能够显著抑制大肠杆菌BLCC8-0102(078)增殖；选择48头体重相近的断奶仔猪随机分成2组，对照组饲喂基础饲粮，试验组在基础饲粮中添加2.0‰复合益生菌，每组4个重复，每个重复6头。预试期3 d，正试期28 d。结果表明：与对照组相比，试验组仔猪平均日增重显著提高，耗料增重比、腹泻率显著降低，胃、十二指肠、空肠内容物pH显著降低，粪便中大肠杆菌数量显著降低，乳酸菌活菌数显著升高。综上，复合益生菌能够显著抑制大肠杆菌生长，显著提高断奶仔猪生长性能，改善肠道菌群平衡，降低肠道pH。
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4．Lycopene Affects Intestinal Barrier Function and the Gut Microbiota in Weaned Piglets Via Antioxidant Signaling Regulation(番茄红素通过抗氧化信号调节影响断奶仔猪肠道屏障功能和肠道菌群)

简介：BACKGROUND：In pig production, early and abrupt weaning frequently causes weaning stress, which manifests as oxidative damage, barrier disruption, and digestion and absorption capacity decline. Lycopene exhibits beneficial antioxidant capacity in both humans and other animal models. OBJECTIVE： The present study aimed to investigate the effects of lycopene supplementation on early weaning stress in piglets and the underlying mechanisms by examining the oxidative stress state, gut intestinal barrier function, and the gut microbiota. METHODS：Twenty-four 21-day-old weaned piglets (Duroc × [Landrace × Yorkshire], castrated males, 5.48 ± 0.10 kg initial body weight) were randomly assigned to two treatments. The piglets were fed a basal diet (control treatment) or a basal diet supplemented with 50 mg/kg lycopene (lycopene treatment) for 28 days. Serum lipid levels, serum and jejunum enzyme activities, jejunum morphology, mRNA and protein expression, and gut microbiota were determined. RESULTS： Compared with the control treatment, lycopene supplementation increased serum CAT activity (P = 0.042, 62.0%); serum TC concentration (P = 0.020, 14.1%); and jejunum SOD (P = 0.032, 21.4%) activity, whereas it decreased serum (P = 0.039, 23.0%) and jejunum (P = 0.047, 20.9%) H2O2 concentrations. Additionally, lycopene increased the mRNA and protein expression of NRF2 (214.0%; 102.4%) and CD36 (100.8%; 145.2%) in the jejunum, whereas it decreased those of KEAP1 (55.6%; 39.8%). Lycopene also improved jejunal morphology, increasing the villus height (P = 0.018, 27.5%) and villus/crypt ratio (P < 0.001, 57.9%). Furthermore, it increased the abundance of potentially beneficial bacterial groups, including Phascolarctobacterium and Parasutterella, and decreased that of

potentially pathogenic bacterial groups, including Treponema_2 and Prevotellaceae_unclassified. CONCLUSIONS : Lycopene supplementation strengthens intestinal barrier function and improves the gut microbiota in weaned piglets by regulating intestinal antioxidant signaling.

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5．基因编辑猪的研究现状

简介：猪是重要的农业经济动物，猪肉是人类获得蛋白质营养物质的主要途径之一。与此同时，猪在解剖学、生理学及遗传背景、疾病特征等方面与人类极为相似。因此，猪既是农业动物生产性状改良的重要对象，又是人类疾病、异种器官移植等生物医学领域的研究对象。随着基因编辑技术的飞速发展，出现了越来越多操作简单、运用广泛且安全的新型编辑技术，可以快速获得单碱基编辑、基因敲除或敲入的细胞系，并通过体细胞克隆等技术获得基因编辑猪。综述了基因编辑猪的制备及其在农业及医学领域中的研究进展，以期为猪的农业生产性状改良和医学研究提供参考。

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