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## 断奶应激对仔猪肠形态、肠黏膜屏障和p38丝裂原活化蛋白激酶信号通路的影响

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### Effects of Weaning Stress on Intestinal Morphology, Mucosal Barrier and p38 MAPK Signaling Pathway in Piglets

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**摘要** 本试验旨在研究早期断奶仔猪肠黏膜屏障变化及其对p38丝裂原活化蛋白激酶(p38 MAPK)信号通路的影响。选取21日龄“杜×长×大”仔猪12窝,每窝选取2~3头平均体重为(5.8±0.4) kg的仔猪断奶,为断奶组,每窝剩下的仔猪不断奶继续哺乳至35日龄,为哺乳组,分别于仔猪22、24、28和35日龄屠宰取样,每次每组6头。结果表明:与哺乳组相比,断奶组空肠绒毛高度和绒毛高度/隐窝深度在22、24和28日龄均显著降低( $P<0.05$ ),隐窝深度均显著提高( $P<0.05$ ),35日龄上述指标断奶组与哺乳组差异不显著( $P>0.05$ )。断奶组在断奶后的不同时间肠形态发生了变化,断奶仔猪24和28日龄空肠绒毛高度/隐窝深度显著低于22日龄( $P<0.05$ ),35日龄断奶仔猪空肠绒毛高度和绒毛高度/隐窝深度显著高于22、24和28日龄( $P<0.05$ )。与哺乳组相比,血浆D-乳酸含量和二胺氧化酶活性在断奶后不同时间均显著增加( $P<0.05$ ),35日龄断奶组仍显著高于哺乳组( $P<0.05$ )。与22日龄断奶仔猪相比,24日龄p38 MAPK磷酸化水平与总水平的比值显著增加( $P<0.05$ ),并达到高峰,随后此比值随着日龄的延长逐渐降低。结果提示,21日龄仔猪断奶后肠形态和肠黏膜屏障受损,在35日龄肠形态基本恢复,但是肠道通透性仍未恢复,仔猪断奶后肠道通透性的恢复滞后于形态学重建,断奶应激激活了p38 MAPK信号通路。

**关键词:** 断奶仔猪 肠形态 肠通透性 p38丝裂原活化蛋白激酶信号通路

**Abstract:** This experiment was conducted to investigate the effects of early weaning stress on intestinal morphology, mucosal barrier and p38 mitogen-activated protein kinase (p38 MAPK) signaling pathway of piglets. Piglets (Duroc×Landrace×Yorkshire) of 12 litters were chosen and 2 to 3 piglets (adjusted for body weight) from each litter were weaned and served as a weaned group. The remaining unweaned piglets were continued to nurse and served as an unweaned group. Six piglets of each group were chosen to slaughter at 22, 24, 28 and 35 days of age, respectively. The results showed as follows: compared with the unweaned group, jejunal villus height and the ratio of villus height to crypt depth at 22, 24 and 28 days of age in the weaned group were decreased ( $P<0.05$ ), while there was no significant difference at 35 days of age ( $P>0.05$ ). The ratio of villus height to crypt depth of the weaner piglets at 24 and 28 days of age was lower than that at 22 days of age ( $P<0.05$ ). The weaner piglets had higher jejunal villus height and the ratio of villus height to crypt depth at 35 days of age than those at 22, 24 and 28 days of age ( $P<0.05$ ). Compared with the unweaned group, plasma D-lactate content and diamine oxidase activity were increased with the increasing duration of weaning and still higher than those in the weaned group at 35 days of age ( $P<0.05$ ). Weaning stress activated p38 MAPK signaling pathway and significantly increased the ratio of colonic mucosa phospho-p38 MAPK and total p38 MAPK expression at 24 days of age compared with 22 days of age ( $P<0.05$ ). The results indicate that early weaning induces the damage of intestinal morphology and mucosal barrier. Although damaged intestinal morphology is near to reinstitution entirely at 35 days of ages, intestinal mucosal barrier is not recovered, indicating the recovery of mucosal barrier is slower than that of morphology. Early weaning stress activates p38 MAPK signaling pathway.

**Keywords:** weaner piglets, intestinal morphology, intestinal permeability, p38 MAPK signaling pathway

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