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A Meta-Analysis to Establish the Effects of Probiotics on Growth Performance and Diarrhea Reduction in Swine

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We conducted a meta-analysis to evaluate the effects of probioticson the growth performance and reduction of diarrhea in swine. We searched databases (e.g., PubMed, Scopus, and EMBase [ScienceDirect]) for papers written in English from 2005 to 2016. The inclusion criteria were as follows: studies using randomized and controlled experimental designswith pigs at any stage of development, with or without a pathogen challenge, published in peer-reviewed journals. Twenty six papers covering more than 800 experiments were considered for evaluation to establish the effects of probiotics on growth performance as measured by average daily gain (ADG), average daily feed intake (ADFI) and feed efficiency (FE). In addition, probiotic effects on diarrhea incidence (DI) and total coliform population (TC) and E. coli (EC) were also assessed.Probiotic supplementation of feeds increased ADG (mean difference = 23.4 g/day) and has improved feed efficiency (mean difference = −0.0188 kg feed/kg body weight). Although antibiotic supplementation contributed to more gain ADG (mean difference = 39.3 g/day), feed efficiency from administered probiotics was better (mean difference = 0.0313 kg feed/kg body weight). Mono-strain probiotics in feeds also favored growth performance ADG (mean difference = 21.4 g/day)and feed efficiency (mean difference = −0.0504 kg feed/kg body weight) than multi-strain probiotics with ADG (mean difference = 19.7 g/day) and (mean difference = −0.0037 kg feed/kg body weight), respectively,when added to feeds. Effects of probiotics on daily gain were more prominent in piglets but feed efficiency was more noticeable in adult pigs. Mono-strain probiotics were more effective in significantly reducing DIand TCs, whereas multi-strain probiotic preparations were effective in reducing EC. Probiotic supplementation also significantly reduced DI and TCs in adult pigs as well as EC in piglets. The magnitude of probiotic effects was similar to that of antibiotics in reducing DI when added to feed, regardless of the age of the pigs. Additionally, probiotics performed similarly to antibiotics in experiments using mono-strain and adult pigs to reduceTCs. We observed significant evidence of inter-experiment heterogeneity, which may have resulted from differences in study designs among experiments or from other factors not considered in our analysis. Overall, our results affirm the benefits of probiotic administration in swine for improved growth performance and reducing diarrhea.