Two experiments were conducted to study the effect of supplemental 100 g/day of live Bacillus cultures (2 · 10 11 cell of Bacillus subtilis and Bacillus licheniformis) on rumen fermentation as well as milk yield and composition in Chinese Holstein cows. In experiment 1, investigating 3 · 10 cows, milk yield and milk protein were increased by using B. licheniformis (p < 0.05) in comparison with an unsupplemented group and the B. subtilis group. Body weight was not significantly affected by Bacillus culture supplementation (p > 0.05). Percentage of milk fat and lactose was not significantly different between treatments (p > 0.05). But milk protein increased with B. licheniformis supplementation (p < 0.05). In experiment 2, carried out with three non-lactating rumi- nally and duodenally fistulated cows, results showed that B. licheniformis supplementation increased microbial crude protein flow into duodenum (p < 0.05) and decreased the ammonia nitrogen concentration in rumi- nal fluid at 0.5 h, 1 h, 3 h, 6 h after morning feeding (p < 0.05). Bacillus licheniformis supplementation increased total VFA and acetate concentra- tion in ruminal fluid at 0.5 h, 1 h, 3 h, 6 h after morning feeding (p < 0.05). Bacillus subtilis had no significant effect on rumen fermenta- tion characteristics, duodenal microbial N flow and ruminal apparent nutrient digestibility (p > 0.05). Bacillus licheniformis increased ruminal apparent nutrient digestibility of neutral detergent fibre, acid detergent fibre, and organic matter (p < 0.05).

The term ‘direct-fed microbial (DFM)’ has been defined as ‘a live microbial feed supplement, which beneficially affects the host animal by improving its intestinal microbial balance’ (Fuller, 1989; Krehbiel et al., 2003). Concern regarding the use of antibiotics and other growth stimulants in the animal feed industry has increased in recent years. There has been increasing emphasis placed on disease preven- tion as a means of reducing the use of antibiotics. A definitive mode of action for bacterial or fungal DFM has not been established, although a variety of mechanisms have been suggested. These include the modification of rumen or lower gut microbial popu- lations, alteration of rumen fermentation patterns, increased intestinal nutrient flow, improved diet digestibility and immune system modulation (Yoon and Stern, 1995; Krehbiel et al., 2003). The effect of DFM supplementation on cow performance or rumen fermentation has been reviewed by several authors (Martin and Nisbet, 1992; Jouany, 1994; Newbold, 1995; Nocek and Kautz, 2006). Although DFM supplementation has improved milk produc- tion, component yield, feed efficiency and health, animal response to DFM have been inconsistent. In addition, results of DFM studies conducted with dairy cattle are difficult to compare because of the many different organisms, strains of organisms, and combinations of multiple organisms that have been supplemented. Other differences among studies include the DFM inclusion level in the diet, diet composition, feed intake and feeding frequency, along with animal factors such as age, physiological stage, health and stress status (Wagner et al., 1990). Variable response to feeding bacterial DFM in ruminant production systems emphasizes the need for greater understanding of underlying mechanisms. The objective of this study was to determine the effect of added Bacillus culture on milk yield and composition and on apparent total tract nutrient digestibility and rumen fermentation of Chinese Holstein cows in early lactation.