INFLUENCE OF DIFFERENT CULTURES OF LACTOBACILLI ON PERFORMANCE, BLOOD CHEMISTRY, AND IMMUNE RESPONSE OF NURSERY PIGS

By

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CHAPTER I

INTRODUCTION

Much research has been reported on probiotics and their use in swine. Some of areas that have been researched are influence on growth and performance, sub therapeutic antibiotic replacement, improved immune function, and pathogen reduction. One of the most commonly used probiotics is lactobacilli.

It has been demonstrated in nursery pigs that a mixture of lactobacilli has the capability to enhance the immune system. Feeding this mixture increased the cytokine interleukin 8 (IL-8) following a challenge of the pigs with lipopolysaccharide (LPS) (Walsh et al. 2008). A combination of certain species of lactobacilli, when combined with selenium, improved immunoglobulin G (IgG) levels in weanling pigs (Yu et al. 2004). A five-strain probiotic product, with species of *Lactobacillus*, decreased the prevalence of *Salmonella* Typhimurium. In addition, the probiotic reduced diarrhea and increased feed intake in the challenged swine (Casey et al. 2007). A commercially available product that contained streptococci and lactobacilli improved average daily gain and feed intake in pigs that were subjected to stress (Estienne et al. 2005). Various cultures of lactobacilli have the ability to excrete substances that are beneficial to the pig. Researchers have reported lysine and amylase production by different cultures of lactobacilli isolated from swine. These secreted constituents improved the overall growth and performance of swine that consumed the cultures (Gilliland 1990, Lee et al. 2001). Also, lyophilized *L. reuteri* has shown to improve feed conversion in Landrace piglets (Chang et al. 2001).

The objective of this study was to evaluate eight different cultures of lactobacilli to determine which one(s) offer(s) the greatest potential as a probiotic for nursery pigs. There were two studies involved where each study contained a control group and four treatment (culture) groups. Growth and performance of individually housed nursery pigs were evaluated, as well as certain blood chemistry analytes and various components of the immune system. Additionally, the possible immune enhancing effects of the probiotic cultures were tested.

CHAPTER II

REVIEW OF LITERATURE

<u>Probiotics/Direct-fed Microbials</u>:

Probiotics (direct-fed microbials) are defined as "A live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance" (Fuller 1992). Some of the more widely used bacterial probiotics include species of the following genera: *Lactobacillus, Bifidobacterium, Propionibacterium, Enterococcus, Streptococcus, Pediococcus, Lactococcus, Bacillus,* and *Leuconostoc* (Fuller 1992). Lactobacilli and bifidobacteria are the most common species of direct-fed microbials (DFM) (Saarella et al. 2000). There are several criteria a bacterium must fulfill before it can be considered for use as a probiotic. The microorganism should be included on the Generally Recognized As Safe (GRAS) list. The bacterium must be able to survive, grow, and function in the gastrointestinal tract of the host, should be host specific, and acid and bile tolerant (Fuller 1992). There have been numerous studies performed with lactic acid bacteria (LAB) as beneficial probiotics. Lactic acid bacteria have demonstrated the ability to achieve the following: improvement of the nutritional value of food, anti-carcinogenic activity, control of intestinal pathogens, management of serum cholesterol levels, and enhancement of lactose utilization (Gilliland 1990).

Lactic Acid Bacteria (LAB):

Lactic acid bacteria (LAB) are catalase negative, Gram positive rods or cocci that produce lactic acid as a major end product of fermentation (Sneath et al. 1986). The bacteria are found in decomposing plant material. The many genera that encompass the LAB are *Lactobacillus, Lactococcus, Leuconostoc, Pediococcus,* and *Streptococcus* (Sneath et al. 1986). Lactic acid bacteria are often mentioned as being important to improve health. These bacteria are used in cultured foods, such as dairy, vegetables, and meat, to create desired texture, flavor, nutritional value, and shelf-life of various foods and beverages. Bacterocins are antimicrobial proteins or peptides produced by some LAB. These compounds have known antimicrobial properties and thus may be important in improving shelf-live. Lactic acid bacteria, when used as probiotics or DFM, have been shown to improve the health of humans and animals (Downes and Ito 2001).

Research reports have indicated probiotics and DFM improve the nutritional value of food. It has been shown that natural lactic acid fermentation, when used on grains, can increase the nutritional availability of various nutrients. An increase in nutritional value of corn by lactic acid bacteria results from increased the availability of essential amino acids (Gilliland 1990). Another nutritional value is that some LAB excrete lysine. It has been demonstrated that pigs fed a diet low in protein, compared to the control, tended to have higher weight gains when fed a *Lactobacillus* strain that excreted lysine (Gilliland 1990).

Lactic acid bacteria and bifidobacteria can improve the growth of piglets and newborn calves. Abe et al. (2005) reported Holstein calves administered *B. pseudolongum* or *L. acidophilus* demonstrated a significant (P<0.05) increase in body weight compared to the control group. It was also observed that the feed to gain ratio and feed intake was better in both DFM groups than the control. In the same study, another study was done using 40 piglets. The piglets were administered *B. thermophilus* and *B. animals* or the control milk replacer. The mortality rate of the piglets fed *Bifidobacteria* was significantly (P<0.05) lower than the control. In addition, it was revealed that the pigs fed direct-fed microbials had higher weight gains than the control.

Swine have often been used as animal models to study lowering of cholesterol by lactobacilli. One report that used Göttingen minipigs revealed a lowering effect on serum cholesterol levels using a cocktail of two strains of *L. johnsonii* and one strain of *L. reuteri* all isolated from pigs. This was associated with an increase in numbers of *Lactobacillus* in the feces (Du Toit et al. 1998). In a study done by De Rodas et al. (1996), Yorkshire barrows were used to test the effects of lowering cholesterol using a combination of a strain of *L. acidophilus* and calcium. It was revealed that the DFM and the calcium tend to boost the reduction of serum cholesterol. The swine in the latter studies were fed a high cholesterol diet. This is helpful in understanding the way the human system works, since swine are closely related to humans when it comes to the treatment of hypercholesterolemia.

Lactic acid bacteria have been shown to decrease numbers of microbial intestinal pathogens. A major foodborne pathogen is *Escherichia coli* O157:H7. It was first identified as a pathogen in the early 1980's and has been a continual problem in the food industry (Brashears et al. 1998). Smith et al. (2005) reported that *E. coli* O157:H7 was inhibited in ground beef by a cocktail of LAB by 3 log cycles after 3 days at refrigeration temperatures. Another study done by Gilliland and Speck (1977) revealed a decrease of *E. coli* using *L. acidophilus* strains when grown in associative broth cultures. This study showed as much as an 87% inhibition of *E. coli* by a strain of *L. acidophilus*. Lactobacilli also have the capability to inhibit other pathogens, such as *Salmonella* Typhimurium, *Staphylococcus aureus,* and *Clostridium perfringens*, in associative broth cultures (Gilliland and Speck 1977). Lactobacilli have also been shown to decrease *E. coli* O157:H7 in fecal shedding of cattle (Younts-Dahl et al. 2005).

***LACTOBACILLUS REUTERI* AND REUTERIN PRODUCTION:**

Lactobacillus reuteri is a heterofermentative, non-spore forming bacterium that is found in the gastrointestinal tract of animals and humans. Named after a German bacteriologist, G. Reuter, *L. reuteri* is a Gram positive lactic acid bacterium that is a slightly bent rod that can occur in singles, pairs, or small clusters. The mesophilic bacterium grows at 45℃, is catala se negative, and produces ammonia from arginine (Sneath et al. 1986).

Lactobacillus reuteri as a Probiotic/Direct-fed Microbial:

Lactobacillus reuteri has been used in many different animal species as a direct-fed microbial and humans as a probiotic. Yogurt supplemented with *L.*

rhamnosus and *L. reuteri* was fed to twelve Nigerian HIV positive women at a concentration of 2.5 x 10^9 cfu/mL. The supplemented yogurt eliminated nausea, diarrhea, and flatulence in all 12 treatment patients compared to 2 of the 12 control patients. The treatment group also exhibited an overall increase in cluster of differentiation 4 (CD4) counts; therefore, increasing the immune system (Anukam et al. 2008).

Mukai et al. (2002) tested the competitive binding of *L. reuteri* and *Helicobacter pylori* to *H. pylori* glycolipid receptor molecules, sulfatide and gangliotetraosylceramide (asialo-GM1). The objective of the study was to see if *L. reuteri* competed for the same glycolipids as *H. pylori*. The *L. reuteri* TM105 of chicken origin and the laboratory isolate strain JCM1081 both bound to the asialo-GM1 and sulfatide glycolipids, thus preventing *H. pylori* from binding. It was suggested that the lactobacilli produced a cell surface protein that inhibited *H. pylori* binding.

Lactobacillus reuteri was used in a survival and persistence swine study that was reported by De Angelis et al. (2007). The treatment pigs were fed a cocktail of *L. plantarum* 4.1 and *L. reuteri* 3S7 at 10^{10} viable cells per day where as the control group was not. The *L. reuteri* survived in the gastrointestinal tract of the pigs and was able to persist in the feces at 10^6 – 10^8 cfu/g for six days after administration.

Fermented milk containing the probiotic *L. reuteri* was fed to swine (Ratcliffe et al. 1986). An additional treatment was yogurt that contained *L. acidophilus* and *Streptococcus thermophilus*. The results revealed that the fermented milk and yogurt treatments did not differ significantly with both causing increases in total lactobacilli and decreases in *Enterobacteriaceae*.

<u>*Reuterin:*</u>

Lactobacillus reuteri produces a low molecular weight compound known as reuterin (Sung et al. 2003). Reuterin or β-hydroxypropionaldehyde (3-HPA) is produced under anaerobic conditions from the fermentation of glycerol. Reuterin is an antimicrobial compound that is water soluble, resistant to lipolytic and proteolytic activity, and active at a very wide pH spectrum (Arqués et al. 2004). It also has a wide antimicrobial range against Gram positive and Gram negative bacteria, along with protozoa, yeast, and molds (Kabuki et al. 1997, Cleusix et al. 2007).

Researchers reported in 2008 the sensitivity of intestinal bacteria to reuterin produced from *L. reuteri* ATCC 55730. Most of the bacteria tested, including *E. coli*, were inhibited by concentrations of 7.5-15.0 mM. *Bacteroides* species, *Bifidobacterium* species, *Eubacterium* species, and *Clostridium difficile* displayed a sensitivity of less than 7.5 mM of reuterin. However, certain species of lactobacilli and *Clostridium clostridioforme* displayed a resistance of 15.0 to 50.0 mM of reuterin (Cleusix et al. 2008).

Reuterin also has been tested in dairy products. Various concentrations of reuterin were tested to study the antagonistic effect toward *Listeria monocytogenes* and *E. coli* O157:H7 in milk and cottage cheese. Results revealed that the reuterin had a more inhibitory effect on the *E. coli* O157:H7 than the *L. monocytogenes*. Reuterin did, however, show a bactericidal effect on both pathogens in the milk and cottage cheese. It was also discovered that the supplementation of 3% salt improved the effects of reuterin (El-Ziney and Debevere 1998).

Another dairy study tested reuterin (R) in inoculated caujada, a dairy product manufactured in Spain, for control of the foodborne pathogens *L. monocytogenes* and *S. aureus*. It was observed that when the reuterin was added to the caujada there was a slight or minimal inhibition of the pathogens. However, when the reuterin was added with nisin (N) and lactoperoxidase (LPC) system, inhibition was seen. After day 12 the R + N + LPS combination produced the best results with *L. monocytogenes* being non-detectable and the *S. aureus* counts displaying a five log cycle decrease compared to the control (Arqués et al. 2008).

GASTROINTESTINAL TRACT MICROFLORA IN SWINE:

The gastrointestinal tract of swine is heavily populated with microorganisms. There are approximately 10^7 - 10^9 cfu/g in the stomach, 10^9 cfu/g in the distal small intestine, and 10^{10} - 10^{11} cfu/g in the large intestine. Some of the common genera that dominate these areas are *Lactobacillus, Streptococcus, Peptococcus, Eubacterium, Bacteroides, Bifidobacterium,* and *Clostridium* with over 90% of the bacteria being Gram positive (De Angelis et al. 2006, Barnes 1986). The genera of most importance are *Lactobacillus* and *Streptococcus* because of their capability to help the gut function properly and improve health (Mare et al. 2006). It is believed that the first inhabitants of the swine intestinal tract are streptococci and *Enterobacteriaceae*; however, lactobacilli counts do increase immensely after a week of birth (Natio et al. 1995).

It is suggested that *Lactobacillus* ssp. exist predominantly in the small intestine at cell numbers between 10^7 – 10^9 cfu/mL (Mare et al. 2006). A report by Naito et al. (1995) described that the most common species of lactobacilli in the piglet are *L. acidophilus* and *L. reuteri*. It was observed that the first *Lactobacillus* that appeared in the piglets' intestines was *L. reuteri*, which was isolated on the first day of birth. *Lactobacillus acidophilus* first colonized the gut after a week of birth. It was also observed that the isolated lactobacilli were from the dams, as well as, the environment. Lactobacilli, along with species of *Bacillus*, *Bifidobacterium*, *Enterococcus*, and *Saccharomyces*, are common probiotics associated with swine (Mountzouris 2006). There are many uses for lactobacilli in swine as probiotics, such as, control of intestinal pathogens, eliminating antibiotic usage, and an increase in growth and performance.

DIRECT-FED MICROBIALS IN SWINE:

Xenotransplantation:

There have been numerous applications of lactobacilli direct-fed microbials in swine. One new use of lactobacilli as a beneficial dietary adjunct is for swine being grown for xenotransplantation. Germfree piglets orally inoculated once with *Lactobacillus paracasei* ssp. *paracasei* GS-1, a pig isolate, at two days of age did not have a significant effect on piglet growth. A few reasons for this insignificance could be that the *L. paracasei* GS-1 was utilizing nutrients for its own biological activities or it was causing an inflammatory response in the intestine that affected nutrient utilization. It was also stated that this microbe could have the potential to cause an infection in these xenotransplant swine by infecting the blood and non-alimentary tissue (Loynachan et al. 2005). This is a problem if the organs from the porcine are going to be used for human organ transplantation.

Feed Additive:

Another area for the use of lactobacilli in swine is as an additive in pelleted feeds. De Angelis et al. (2006) subjected thirty-five pig isolates to a number of tests to determine if the isolates could survive in the stomach and intestinal tract of the pig. Additionally, they did tests to determine if the cultures might have antimicrobial activities against pathogens, viability after freeze drying, and be resistant to heat during feed pelleting. The results revealed that two subspecies of lactobacilli, *L. plantarum* and *L. reuteri*, had the capability to survive in high numbers in all of the latter conditions, thus making them possible swine feed additive DFM.

Pollmann et al. (1980) tested two commercially available swine feed additives to determine the effects on growth and performance of starter and finisher pigs. Probios, containing *L. acidophilus*, and Feed-Mate 68, that contains *S. faecium* type Cernelle 68, were the DFM products used. Pigs fed Probios were superior in performance when compared to the pigs fed *S. faecium*. It was also observed that the DFM, Probios, performed better on starter pigs than on finishers.

Control of Viruses:

Kritas and Morrison (2007) evaluated the influence of feeding *Lactobacillus casei* ssp. *rhamnosus* for the treatment of porcine reproductive and respiratory syndrome (PRRS). The direct-fed microbial was ingested orally through the water system at 6×10^9 cfu per day. Although the DFM did not have an effect on immune response in a way to affect PRRS virus, it did contribute a benefit in regards to average daily gain after pigs were challenged with the virus.

Antibiotic Alternative:

A freeze dried culture composed primarily of *Lactobacillus acidophilus* was used to test its effects on growth performance of swine when compared to the antibiotic virginiamycin. The results revealed that this commercial DFM did not improve feed intake, feed efficiency, or average daily gain (Harper et al. 1983). The reason for this occurrence could be that the bacteria were not isolated from the host it was used in or its benefits in the swine were elsewhere. Another reason for no significant difference could have been from the low concentration of the DFM, 4×10^6 viable cells per gram. Maybe the concentration of the direct fed microbial should have been higher in order to have an effect on the animal (Fuller 1992).

A total of 21,755 nursery pigs were used to test the efficacy of the product BioPlus 2B against subtherapeutic antibiotic usage. BioPlus 2B is a probiotic that contains *B. licheniformis and B. subtilis*. There was no difference in feed to gain ratio, mortality rate, daily gain, daily feed intake, or feed cost per pig when compared to the control animals. Therefore, this DFM could be used in place of the subtherapeutic antibiotics with no negative consequences (Kritas and Morrison 2005).

Increased Immunity:

Improving the health status of the swine industry by enhancement of the immune system is another area where direct-fed microbials have exhibited positive effects. A five-strain DFM product containing 2 strains of *L. murinus,* and one strain each of *L. pentosus, L. salivarius*, and *Pediococcus pentosaceus* was administered to Large White x Landrace crossbred weaned pigs. It was observed that the peripheral cluster of differentiation 4 and 8 plus T cells (CD4+CD8+T cells) were significantly (P<0.05) higher in the pigs fed DFM than the controls, 7.1% vs. 5.2%. After a lipopolysaccharide (LPS) challenge, the DFM group displayed a significant (P< 0.05) increase in the cytokine, interleukin 8 (IL-8), when compared to the control. Therefore, the DFM pigs exhibited an increased immune system when compared to the control pigs (Walsh et al. 2008).

When direct-fed microbials were combined with selenium a positive effect on swine immunodulation was observed. A total of ninety-six weaned pigs were randomly allotted to four treatment groups. The treatments were as follows: control, 0.3% DFM (*L. acidophilus, L. pentose,* and *B. subtilis*), 0.3% DFM + 0.3 ppm of organic selenium, and 55 ppm of carbadox. One week before the end of the trial, LPS was injected in the neck of each pig. The production of immunoglobulin G (IgG) was significantly (P<0.05) higher in the DFM + selenium pigs than control pigs. However, the other treatments also exhibited a trend toward higher IgG concentrations than did the controls (Yu et al. 2004).

Another study tested the effects of two different DFM feed additives that are approved in the European Union. The probiotics of interest were Cylactin® (*Enterococcus faecium* NCIMB 10415) and Toyocerin® (*Bacillus cereus* var. toyoi NCIMB 40112). The study included two separate trials. In the both trials, Landrace x Duroc sows were randomly allocated into two groups, control or direct-fed microbial. Sows were fed the DFM 25 days after fertilization and the entire lactation period. Piglets of the DFM group had full access to the feed supplements 15 days after parturition, during weaning, and post weaning. *Bacillus cereus* increased immunoglobulin A (IgA) levels in the intestines in the sows. This DFM also showed an increase in the fecal IgA concentrations in the piglets from the DFM group right after weaning (Scharek et al. 2007).

Pathogen Elimination and Prevention:

Lactobacilli have been used in swine to reduce numbers of pathogens and/or potential pathogens present in the intestines and/or feces. Maré et al. (2006) revealed a decrease in colonization in pigs inoculated with *Enterococcus faecalis*. The direct-fed microbials used were *L. plantarum* and *L. salivarius*. The *L. salivarium* was of porcine origin. However, the *L. plantarum* isolate was isolated from sorghum beer and thus tolerated low pH. The study stated that the *E. faecalis* was inhibited only by 25% in the ileum by the *L. salivarius*. It was stated that the reason for the *L. plantarum* colonization of the ileum and colon was because the microbe was capable of withstanding the low pH of the small intestine and thus could colonize the lower gut. *Lactobacillus plantarum* showed no effect on inhibition of *E. faecalis*.

Research reported by Gardiner et al. (2004) revealed a decrease in mean numbers of fecal *Enterobacteriaceae* by *L. salivarius, L. pentosus, Pediococcus pentasaceus* and a DFM cocktail (*L. salivarius, L. pentosus, P. pentasaceus* and two strains of *L. murinus*). The mean reduction in counts for the treatments were 98%, 97%, 87%, and 97%, respectively, 21 days after culture inoculation. However, the control had a mean reduction of 83%. This revealed no significant differences among the control.

An *in vitro* report studied the effects on adhesion of *Escherichia coli* K88, which causes post-weaning diarrhea, when porcine lactobacilli DFM were present (Blomberg et al. 1993). Using ileal mucus from a 35-day-old pig revealed proteins produced by each of the three lactobacilli caused an approximate 50% reduction in adhesion of *E. coli* K88 cells. The study should be done *in vivo* to further confirm their results.

Salmonella is one of the major culprits of gastroenteritis in humans; therefore, the elimination of the pathogen in swine is a must (Mead et al. 1999). A five-strain DFM product (two strains of *L. murinus*, *L. pentosus*, *L. salivarius*, and *Pediococcus pentosaceus*) was tested for ability to inhibit *Salmonella* in swine. There were three different treatments, a control, fermentate, and cell suspension. The pigs were fed for a total of 30 days. Six days after stopping the DFM, the crossbred pigs were challenged with *Salmonella* Typhimurium. There was a significant (P=0.01) reduction of *Salmonella* in the feces of both the fermentate and suspension. Also, there was a reduction in diarrhea and a greater weight gain for the two direct-fed microbial treatments (Casey et al. 2007).

Growth and Performance:

Improving growth and performance of an animal has always been favored. There have been numerous studies performed that use lactobacilli as a direct-fed microbial in the swine industry to increase growth and performance. Estienne et al. (2005) used a commercially available swine DFM that contained lactobacilli and streptococci. This study revealed that there was no significant difference in pre-weaning performance. However, when the piglets were mixed (non-littermate litters), there was a significant ($P=0.05$) increase in average daily gain and feed consumption of the mixed pigs. In this case, the DFM helped piglets that were subject to stress.

It has been demonstrated that *Lactobacillus acidophilus* can improve the starch utilization of feed in swine. After various tests were done, a *L. acidophilus* isolated from swine, which had a high amylolytic activity, was used for a feeding trial. Seventy-five Yorkshire pigs were allotted into three different treatments. The treatment groups were the following: control, low (3×10^8 cells/feeding), and high (3×10^9 cells/feeding). The DFM treatments demonstrated a significantly ($P<0.05$) higher average daily gain than the control. However, only the low level of direct-fed microbial had a significantly ($P<0.05$) better feed to gain than the other treatments (Lee et al. 2001).

Chang et al. (2001) used a swine isolate of *L. reuteri* to test the feed conversion rate and live weight gain in twenty-five Landrace piglets. The DFM was lyophilized and fed at two different concentrations, 10^6 (P6) and 10^8 (P8) cfu/g. There were five treatment groups: control, antibiotic fed, P6, P8, and P8 plus antibiotics. There was a significant (P<0.01) increase in total counts of lactobacilli in all of the DFM treatments. The direct-fed microbial groups feed conversion rate was significantly (P<0.01) better than the other two treatments. The P6 and P8 treatments consumed 34% less and the P8 plus antibiotics consumed 11% less feed than the control groups.

A total of 144 weaner pigs were used to test the effects of dry feed (DF) vs. liquid feed (LF). While performing the experiment, the microbial activity of the liquid feed was tested. It was revealed that the liquid feed was heavily populated with lactobacilli after five days and resembled a fermented feed. Results revealed that the LF pigs had a significantly (P<0.001) better daily gain than the DF pigs suggesting that the lactobacilli were at least partially responsible (Russell et al. 1996).

Direct-fed microbials have shown a potential to improve the performance of sows. A total of thirty-three first parity German Landrace sows were assigned to one of two groups (control or DFM). *Enterococcus faecium* DSM 7134 was fed to the DFM sows as a premix at 5 x 10^8 cfu/kg from day 90 of pregnancy until day 28 of lactation. There was a significant (P<0.03) difference in daily feed intake during lactation with the DFM sows consuming 0.45 kg/day more. The number of piglets born alive was significantly (P<0.05) higher in the DFM-fed sows (9.2 vs. 7.7 piglets/litter). There was a trend to decrease mortality in the direct-fed microbial group than the control, 9% and 11%, respectively (Böhmer 2006).

There are many different potential benefits of *Lactobacillus* species as a DFM in swine. It is generally accepted that to have a positive impact on the animals it should be host specific and capable of surviving the stomach and gastrointestinal tract. However, it also should be understood that not every isolate of lactobacilli has positive effects on its host, in this case, a pig.

FOODBORNE PATHOGENS IN SWINE:

Salmonella:

Salmonella was first isolated from meat that had caused food poisoning in 1888 by Gaertner (Jay 2000). The bacterium is a Gram negative rod that is a facultative anaerobe (Krieg 1984). *Salmonella* are primarily found in the intestines of farm animals, humans, birds, reptiles, and rarely insects (Jay 2000). Some of the general symptoms of salmonellosis are fever, abdominal cramping, vomiting, chills, diarrhea, nausea, powerlessness and has the potential to be fatal (Ray 2001). It was reported in 1999 that 1,381 deaths were due to acute gastroenteritis where *Salmonella* accounted for 31% of those deaths (Mead et al. 1999). The Centers for Disease Control and Prevention (CDC) reported approximately 40,000 cases of salmonellosis occur a year in the United States with roughly 400 people dying from the bacterium a year. *Salmonella* is also more prevalent in the summer than the winter. The most common serotypes in the United States are Typhimurium and Enteritidis (Centers for Disease Prevention and Control 2008b).

The incidence of *Salmonella* in U. S. swine farms is distributed throughout the United States. A recent study tested the prevalence of *Salmonella* species in farms for various animal species. There were 18 farms in five states (California, Alabama, North Carolina, Tennessee, and Washington) tested over a 2 year period. The types of swine farms included were production and farrowing. Various types of samples were taken including feces, rectal swabs, feed, bedding, soil, and litter. The percent of *Salmonella* positives are as follows: 33.3% fecal material, 16.7% fresh feed, 6.0% rectal swabs, 22.9% soil, and 29.2% trough feed (Rodriguez et al. 2006).

Several *Salmonella* species have been discovered in slaughterhouses. In 1989 there was a study that reported the frequency of *Salmonella* and other pathogens on swine carcasses and the slaughterhouse atmosphere. There were several different items tested for the pathogen including pig feces, diaphragms, slaughterhouse floor, and cold room floor. *Salmonella* was discovered in 45 of the 448 total samples obtained which turned out to be 10% of the pigs being carriers. The total number of positives were as follows: 3 of 200 diaphragms, 2 of 16 cold room floor swabs, 4 of 16 slaughterhouse floor swabs, and 36 of 200 feces. The most common strain found was *S. brandenburg* (Mafu et al. 1989).

Another study tested the prevalence of *Salmonella* in the slaughterhouse, the farm the swine came from, and the trucks used for transportation. It was demonstrated that *S. bovismorbificans* was isolated from the truck and the carcasses. Isolates of *S. bredeney* were recovered from the truck and cecal contents. The truck, cecal contents, and lymph nodes were positive for *S.* Derby. Therefore, these species of *Salmonella* were introduced to the swine after the farm during transportation. Isolates of *S.* Typhimurium were found in the swine and environmental samples, but never at the slaughterhouse. However, this species was the most prevalent found at the farm (Magistrali et al. 2008).

Yet a different study reported that *Salmonella* Typhimurium was the most prevalent species detected in the slaughterhouse (Botteldoorn et al. 2003). The samples collected included environmental, mesenteric lymph nodes, feces from the colon, and carcass. They found 37% of the carcasses, 19% of the feces, and 21% of the mesenteric lymph nodes were positive for *Salmonella*. It was estimated that cross-contamination accounted for 29% of the carcass positives. The most prevalent *Salmonella* serotypes isolated from the environment and the feces were Typhimurium, Derby, and Livingstone. The most prevailing bacterium that was isolated from the carcasses was *S*. Typhimurium.

A major concern of salmonellosis is the multidrug-resistant *S.* Typhimurium DT104. This strain of *Salmonella* is usually resistant to at least 5 drugs, which are tetracycline, ampicillin, streptomycin, chloramphenicol, and sulfonamides. The first known isolate of DT104 was in the United Kingdom in the early 1980’s. By the 1990’s, the isolate was worldwide. *Salmonella* Typhimurium DT104 has been isolated from beef, sheep, pigs, and poultry (Helms et al. 2005). Lee et al. (2007) acquired intestinal contents from 152 Korean pigs. *Salmonella* species were recovered from ten of the samples with one isolate having the characteristics of DT104. Another study performed by Farzan et al. (2008), tested 100 Ontario farms. Seventeen percent of the farms tested positive for *S*. Typhimurium DT104. There was a total of 80 positive isolates that was recovered from the swine feces and environmental samples.

However, it was been reported that *Salmonella* is more prevalent in antimicrobial-free (ABF) swine production systems than the conventional systems. From 20 farms sampled in North Carolina (10 conventional and 10 ABF) there were a total of 889 pigs and 743 carcasses tested for the presence of *Salmonella*. There was a significant difference between positive *Salmonella* isolates between the conventional and ABF production systems, 4.2% and 15.2%, respectively (Gebreyes et al. 2006).

Campylobacter:

Campylobacter enteritis is considered to be the most prevalent foodborne pathogen in the United States, even more prevalent than *E. coli* and *Salmonella* (Jay 2000). The pathogen is a Gram negative, microaerophilic spirella bacterium (Krieg 1984). It is estimated by the CDC that approximately 124 people die per year from infections from *Campylobacter*. Like *Salmonella*, *Campylobacter* occurs more frequently in the summer than the winter (Centers for Disease Control and Prevention 2008a). The majority of the species responsible for the enteritis is *C. jejuni*. Some of the symptoms of *Campylobacter* enteritis are fever, abdominal cramps, headache, and diarrhea. In severe cases, the symptoms may include bloody stools where the diarrhea is similar to ulcerative colitis. The bacterium is found in warm-blooded animals rather than the environment with a large proportion of the meat animals shedding it in their feces (Jay 2000). The common species in swine is *C. coli* (Jacobs-Reitsma 2000).

Campylobacter is very prevalent in antibiotic-free swine production systems. Harvey et al. (1999) examined four continuous-flow farms that were free of subtherapeutic antibiotics for five years. The nine month study collected the viscera from the pigs during slaughter and cecal contents obtained from the viscera were used for testing. It was discovered that *Campylobacter* species were isolated from 70% to 100% of the swine tested. Of the samples tested, *C. coli* was dominant followed by *C. jejuni* and *C. lari*. The average $\log_{10}$ concentrations of *C. coli* and *C. jejuni* isolates were 4.65 cfu/g. Another study was done to test the prevalence of *C. coli* in five antimicrobial-free (ABF) herds. It was done to see if there was any difference in outdoor (extensive) and indoor (intensive) environmental systems. The extensive swine were reared outside and had full access to soil. However, the intensive swine were raised in confinement with slatted floors, no soil. There were two types of samples obtained, farm and slaughter. Farm samples were feces from live swine and the slaughter samples were carcass swabs. Of the 546 samples collected, 526 were positive for *C. coli*, with 160 from slaughter and 366 from the farm. There was no significant difference observed between the extensive and intensive rearing (Gebreyes et al. 2005). One could argue that the reasons for such high numbers of *Campylobacter* are because of the continuous-flow system and from the elimination of the subtherapeutic antibiotics.

However, *Campylobacter* is also ubiquitous in swine slaughter facilities where the pigs are housed in different swine systems. Malakauskas et al. (2006) studied the prevalence of *Campylobacter* in the slaughterhouses. It was discovered that 120 samples were positive for *Campylobacter*. It was also found that *C. coli* was the most prevalent isolate and *C. jejuni* was second. Another study by Pearce et al. (2003) tested the occurrence of *Campylobacter* in swine facilities. A total of 360 carcasses were sampled over a 30-day period. Just as in the previous study, *C.* coli was dominant followed by *C. jejuni*. However, this study revealed that there was no measurable presence of *Campylobacter* on the carcasses after chilling them overnight.

Species of *Campylobacter* have been reported on uncooked retail pork. Of approximately 1000 uncooked retail meats from various animal species, 259 samples were positive for *Campylobacter*. Of these positive samples, 21 were pork products. There were 18 *C. jejuni* positives and 3 *C. coli* positives isolated (Wong et al. 2007).

A *Campylobacter* species of possible concern that has been identified in swine is *C. hyointestinalis*. A report by Gorkiewicz et al. (2002) described a case study where an elderly woman acquired a bacterial gastroenteritis infection. After many characteristics tests were performed, the infecting bacterium was identified as *C. hyointestinalis*. Following further investigation, it was discovered that the isolate was acquired from a pig that the woman owned.

Escherichia coli O157:H7:

Escherichia coli O157:H7 is a facultative anaerobic, Gram negative rod bacterium that was first identified as a foodborne pathogen in 1982 (Krieg 1984, Buchko et al. 2000). *Escherichia coli* O157:H7 causes symptoms such as fever, vomiting, bloody diarrhea, hemolytic uremic syndrome, and in some cases, death. It is estimated that more than 73,000 human infections occur each year in the U.S (Alam and Zurek 2006). Beef and dairy cattle are known carriers of this pathogenic bacterium (Standford et al. 2005). However, over the past decade, *E. coli* O157:H7 has been reported in healthy pigs in the United States, Japan, Sweden, and Canada (Cornick and VuKhac 2008). It was reported that in Chile, the prevalence of *E. coli* O157:H7 was higher in swine than cattle with occurrence being 10.8% and 2.9%, respectively (Cornick and Helgerson 2004).

Cornick and VuKhac (2008) reported that young adult swine, 100 to 150 lbs., can transmit *E. coli* O157:H7 indirectly. In the study, a donor pig was inoculated with 5 x 10^8 cfu of *E. coli* O157:H7 by ingestion of inoculated feed. There was a 100% recovery of the pathogen from the pigs that had nose-to-nose contact with the donor and an 83% recovery from the pigs that were housed in the same room as the donor pig. The reason behind the indirect transmission is likely from contaminated aerosols (Cornick and VuKhac 2008).

One reason that *E. coli* O157:H7 isn't observed as much in swine is the conditions. One study reported by Cornick and Helgerson (2004), stated that the infectious dose for 3 month old pigs was 6 x 10^3 cfu of *E. coli* O157:H7. The pathogen was transmitted by an infected pig at a dose less than 10^4 cfu/g. Three of the seven pigs exposed to the donor pigs that were shedding approximately

10^2 cfu/g of the pathogen were positive. There was a 100% transmission of the pathogen to naïve pigs were the donor pigs were shedding more than 10^4 cfu/g. The study also stated that there is no difference in the type of housing used, floors vs. decks. Therefore, swine do not have a resistance to *E. coli* O157:H7 and under the right conditions could be a reservoir for the pathogen. A few reasons as to why swine have a very low occurrence of the pathogen could be that the farms have good management practices and the majority of the herds don't have any contact with the bacterium (Cornick and Helgerson 2004).

The National Animal Health Monitoring System (NAHMS) collected 2,526 fecal samples from 57 swine farms in 13 of the 17 major swine-producing states. The samples were obtained from August 2000 to April 2001. The fecal samples that were obtained were from 20 weeks or older finishers and cull sows that were within 10 days of slaughter. The feces were tested for several different pathogens, including *E. coli* O157:H7. The results revealed that only 4.2% of the samples tested positive for the O157 serotype (Feder et al. 2007).

Feral swine in Central California have the ability to contract and transmit *E. coli* O157:H7. It is assumed that the feral swine contracted the bacteria from cattle that were residents to the neighboring area. The swine then possibly contaminated the surrounding spinach fields by fecal contamination. The spinach from these fields was linked to an outbreak of *E. coli* O157:H7 that occurred in 27 U.S. states and Canada. The outbreak led to 3 deaths and 205 cases of illness. It was also reported that there was *E .coli* O157:H7 transmission between the feral pigs (Jay et al. 2007).

The first intensive testing for *E. coli* O157:H7 in swine was in 2003. The pathogen was recovered from the colon of slaughtered swine. Samples taken from the distal colon from 305 pigs were collected over an 8 month period. Approximately two to three inches of the feces-filled colon was obtained for testing. After enrichment, characteristic tests, pulsed-field gel electrophoresis (PFGE), ribotyping, and polymerase chain reaction (PCR) were performed, 6 of the 305 samples were positive for *E. coli* O157:H7. It was stated that swine do have the potential to harbor this foodborne pathogen (Feder et al. 2003).

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CHAPTER III

SCREENING CUTLURES OF *LACTOBACILLUS REUERTI* FROM SWINE FOR POTENTIAL USE AS DIRECT-FED MICROBIALS

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ABSTRACT

The objective of this study was to determine the effects of different cultures of lactobacilli on growth and performance of nursery swine as well as blood chemistry and immune response. Sixty Duroc x (Landrace x Yorkshire) crossbred pigs were divided into two studies with 2 experiments/study that were fed a typical nursery diet without antibiotics. Study one treatments were as follows: 1. control milk, 2. milk + *L. reuteri* DS-33 (DS-33), 3. milk + *L. reuteri* WB-74 (WB-74), 4. milk + *L. reuteri* WB-75 (WB-75), and 5. milk + *L. acidophilus* L-23 (L-23). Study two treatments were as follows: 1. control milk, 2. milk + *L. reuteri* DS-36 (DS-36), 3. milk + *L. reuteri* WB-37 (WB-37), 4. milk + *L. reuteri* WB-72 (WB-72), and 5. milk + *L. reuteri* WB-76 (WB-76). The pigs were individually house in metabolic crates and allowed an approximate one week adjustment period. The pigs were fed 10 mL of milk twice a day for 21 days. The culture treatment groups received the 10 mL of milk + 10^9 cfu/mL of the desired cultures twice daily. Weights and feed (dry weight basis) were measured weekly. The feed was collected, weighed, and dried. Growth and performance data were obtained weekly for 3 weeks. Blood was drawn weekly.   The serum was collected and analyzed for various blood analytes and immunoglobulins. After a 3 week feeding trial, all of the pigs were subjected to a challenge with an *Escherichia coli* O111:B4 lipopolysaccharide (LPS). Blood was drawn and rectal temperatures were measured at hours 0, 1.5, 3.0, 6.0, 12, and 24. Additionally, pig weights were measured at hours 0, 6, 12, and 24. The same analyses were performed as mentioned before. The results for each study were variable.

Cultures DS-33, L-23, and DS-36 tended to cause better feed to gain ratios than observed for the control groups. Pigs fed culture L-23 exhibited a significantly higher total serum protein level than pigs in the control group. A significant difference was observed for serum aspartate aminotransferase (AST) where the culture DS-33 caused a lower level than the control pigs. The cultures WB-74, L-23, and WB-72 tended to increase serum IgA, IgG, and IgM, respectively. Culture DS-36 caused a significantly lower globulin level when compared to the control and DS-37 groups. Albumin:globulin ratio for pigs fed DS-36 or WB-76 was significantly higher than the control pigs at hour 3.0. Also, pigs fed DS-37 showed a significant reduction of levels of total bilirubin, triglyceride, and very low-density lipoprotein (VLDL) at hour 12 during the LPS challenge.

INTRODUCTION

Probiotics (direct-fed microbials) are defined as “A live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance” (Fuller 1992). Some of the more widely used bacterial probiotics and direct-fed microbials (DFM) include species of the following genera: *Lactobacillus, Bifidobacterium, Propionibacterium, Enterococcus, Streptococcus, Pediococcus, Lactococcus, Bacillus, and Leuconostoc* (Fuller 1992). Lactobacilli and bifidobacteria are the most common species of direct-fed microbials (Saarella et al. 2000). Some of these lactic acid bacteria reportedly have the ability to achieve the following: improvement of the nutritional value of food, anti-carcinogenic activity, control of intestinal pathogens, management of serum cholesterol levels, and enhancement of lactose utilization (Gilliland 1990).

Much research has been conducted on the use of lactobacilli to improve growth and performance of swine. A previous study by Lee et al. (2001) reported the production of amylase by a culture of *L. acidophilus* improved feed efficiency in nursery pigs. Lyophilized *L. reuteri* improved feed conversion in Landrace piglets (Chang et al. 2001). A commercially available swine DFM, containing lactobacilli and streptococci, did not improve growth and performance in pre-weaning piglets. However, when the pigs were mixed (non-littermate litters) the DFM caused an increase in feed consumption and average daily gain (Estienne et al. 2005).

Another area of direct-fed microbial research in swine is improving the immune system. Feeding a mixture of lactobacilli to nursery pigs increased the cytokine interleukin 8 (IL-8) following a lipopolysaccharide (LPS) challenge (Walsh et al. 2008). During another LPS challenge immunoglobulin IgG was increased in weanling pigs that were administered a combination of lactobacilli, *Bacillus*, and selenium (Yu et al. 2004).

The focus of the present study was to determine the effects of cultures of *L. reuteri* as potential use as direct fed microbials. A total of sixty nursery pigs were used in two different studies. Each study consisted of four different cultures for a total of eight cultures. Feed conversions were calculated for each pig. Blood serum was used to test for IgA, IgG, and IgG, as well as serum blood chemistry. In addition the pigs were injected with a lipopolysaccharide (LPS) at the end of each trial to study the effects of the cultures of lactobacilli during an immune response.

MATERIALS AND METHODS

<u>SWINE CULTURES</u>:

<u>Source of Cultures:</u>

Cultures were obtained from Oklahoma State University's food microbiology culture collection. Five isolates of lactobacilli from a *Sus scrofa* (wild boar, WB) and nine from *Sus scrofa domestica* (domestic swine, DS) were investigated. The wild boar cultures were isolated from the small intestine of a wild boar in Canadian, Texas and were identified as the following based on phenotypic characteristics: *Lactobacillus reuteri* WB-72, WB-74, WB-75, WB-76, and WB-78. Eight of the domestic swine cultures were isolated from the feces of domestic, free ranging sows in Checotah, Oklahoma and were identified as the following based on phenotypic characteristics: *L. reuteri* DS-29, DS-31, DS-33, DS-35, DS-36, DS-37, DS-38, and DS-39. The last domestic swine culture, *L. acidophilus* L-23, was isolated from the feces of a pig that was housed in the swine barn at Oklahoma State University. The latter culture was used because it has been shown to improve growth and performance in pigs fed a high starch-based diet.

<u>Maintenance of Cultures:</u>

Weekly subcultures of each swine isolate were performed by using 1% inocula into 10 mL of sterile Lactobacilli de Man, Rogosa, and Sharpe (MRS) broth (Difco Laboratories, Franklin Lakes, NJ). The cultures were incubated at 37℃ for 18 hours. Each culture was stored at refrigera tion temperatures (2-5℃)

between subcultures. The isolates were subcultured daily three consecutive times before use in any assay or feeding trial.

<u>IDENTIFICATION OF CULTURES</u>:

Cultures were subjected to the following characteristic tests: Gram stain, catalase test, growth at 15℃ and 45℃, arginine hydrolysis test, and carbohydrate fermentation patterns using Analytab Products Inc. (API) 50 CH system (bioMérieux, France).

The following characterization tests were performed to identify the cultures. Gram stains were performed on each to identify Gram positive rods. Those that were Gram positive were streaked on MRS agar, incubated at 37℃ for 24 hours. Plates were flooded with a 3% hydrogen peroxide solution. The presence of effervescence confirmed a positive for catalase. Gram positive, catalase negative rods were regarded to be a *Lactobacillus* species.

Growth at 15℃ and 45℃ was performed by placing a 1% inoculum in 10 mL of sterile MRS broth. Before inoculating the 15°C tubes, they were placed in a 15℃ water bath and allowed to equilibrate to that temperature. The 15℃ and 45℃ tubes were incubated for 5-7 days in a water bath and 48 hours in an incubator, respectively. The arginine hydrolysis test was done by inoculating (1%) 10 mL of arginine broth followed by incubation at 37℃ for 24 hours (McCoy and Gilliland 2007). The arginine broth was prepared from individual components following the manufacturer's (Difco Laboratories, Franklin Lakes, NJ) directions. One drop of Nessler's reagent (Sigma-Aldrich, St. Louis, MO) was mixed with one drop of each culture. The production of ammonia from arginine was indicated by an orange/gold precipitate. The fermentation patterns of the cultures were performed by using the API 50 CH system following the manufacturer's directions except that the strips were incubated in a Gas Pak anaerobic jar rather than placing mineral oil into each cuplet. The species of the cultures of lactobacilli were determined by comparing results from growth at 15℃ and 45℃, ammonia production from arginine, and the carbohydrate fermentation patterns to those of the lactobacilli in the 9th Edition of Bergey's Manual of Determinative Bacteriology (Sneath et al. 1986).

BILE TOLERANCE ASSAY:

Bile tolerance assay was performed on each isolate as described by Walker and Gilliland (Walker and Gilliland 1993). However, the following exceptions were made to the method. The cultures were inoculated with 1% inoculum in 10 mL of MRS broth + 0.3% oxgall (Difco Laboratories, Franklin Lakes, NJ). Each tube was incubated in a 37℃ water ba th for seven hours. Absorbance readings at 620 nm were measured using a Milton Roy Spectronic 21D UV/VIS Spectrophotometer (Rochester, NY). Comparisons of cultures were based on the increases in absorbance from 0 to 4 hour. The assay was performed twice.

FEEDING STUDIES:

Preparation and Plating of Cultures:

The control milk was a 10% reconstituted skim milk solution that was resuspended with deionized water. Four hundred milliliters of reconstituted milk was brought to a boil, allowed to cool, and aliquoted to four 250 mL sterile bottles (100 mL each). The bottles were stored in the refrigerator (2-5℃) for no longer than 3 to 4 days. Control milk was prepared every 3 to 4 days.

Frozen concentrated cultures of the swine isolates were prepared as described by Gilliland and Rich (Gilliland and Rich 1990) with the following exception. The cultures were grown statically in 500 mL of sterile MRS broth for 18 hours at 37℃. The concentrated cultures were stored in liquid nitrogen until needed. The frozen cultures were prepared two to three weeks before the start of each experiment. The number of viable cells per vial was verified by the pour plate method using appropriate decimal dilutions on MRS agar with an overlay. Sterile diluents were 0.1% peptone (Difco Laboratories, Detroit, MI) and 0.001% Antifoam A (Sigma-Aldrich, St. Louis, MO) in deionized water. The plates were incubated at 37℃ for 48 hours. The appropriate numb er of vials were thawed in cold tap water (100 mL of water/vial) and added to 400 mL of milk prepared as the control milk for a concentration of 1 x 10^8 cfu/mL. The control milk was prepared as described earlier. The 400 mL of milk containing the lactobacilli were distributed into four sterile 250 mL bottles (100 mL each) and stored at 2-5℃ for no longer than four days. Treatment milk was prepared fresh every 3 to 4 days until the end of each experiment.

The control and treatment groups were plated by the pour plate method with an overlay on MRS agar on day 0 and day 3 following preparation to confirm the appropriate concentration of cells was being administered.

Feeding Studies:

Each experiment consisted of fifteen Duroc x (Landrace x Yorkshire) pigs of the same sex (gilts or barrows) that were randomly allocated into one of five treatments at 3 replicates per treatment per experiment for a total of 6 replicates per treatment. The range of the pigs' ages when the experiments began were between 33 – 47 days of age. The pigs were randomly blocked by body weight and ancestry and housed in a controlled environment in individual metabolic crates manufactured by Alternative Design (Springdale, AR). There were two sets of treatments with two experiments per treatment study. Each set of treatments contained 30 pigs with an equal number of barrows and gilts. Study one treatments were as follows: 1. control milk, 2. milk + *L. reuteri* DS-33, 3. milk + *L. reuteri* WB-74, 4. milk + *L. reuteri* WB-75, and 5. milk + *L. acidophilus* L-23 (Appendix B Table B2). Study two treatments were as follows: 1. control milk, 2. milk + *L. reuteri* DS-36, 3. milk + *L. reuteri* WB-37, 4. milk + *L. reuteri* WB-72, and 5. milk + *L. reuteri* WB-76 (Appendix C Table C2). Each pig received 10 mL twice a day of their respective treatment for three weeks. A one week adjustment period was used prior to the treatment period to permit the pigs to adjust to the crates, diet, and administration of the control milk. The pigs were fed *ad libitum* of a ground corn-soybean meal diet without antibiotics (Table 1). (The diet nutrients exceeded requirements based on the swine National Research Council (NRC).) After the adjustment period, the experiment was started by recording the appropriate baseline measurements (day 0). The pounds of feed consumed were recorded for each pig. Any wasted and/or uneaten feed from each pig was collected, dried, and weighed weekly.

Consumed and wasted/uneaten feed was used to calculate average daily feed intake and feed efficiency. Body weights were measured weekly and used to calculate average daily gain and feed to gain ratios. After each replication, the metabolic crates were washed with detergent and rinsed with water, thus disinfected.

PLATING, ENRICHMENTS, AND BAX® SYSTEM:

Plating:

Fecal samples, obtained by rectal palpation, were collected weekly from each pig. The person(s) taking the samples wore Nitrile gloves. However, if feces could not be obtained by this method, an apparent freshly voided fecal dropping was obtained from the pig's metabolic crate. New gloves were worn for each pig to prevent cross contamination. Feces were kept on ice no longer than 2 hours until plating could be accomplished. One gram of feces was weighed into a sterile Whirl-Pack filter bag (Nasco, Fort Atkinson, WI) and a 99 mL sterile diluent was added and pummeled for 60 seconds using an IUL Masticator (IUL Instruments, Barcelona, Spain). Additional dilutions were prepared as described earlier and plated with an overlay using the pour plate technique on *Lactobacillus* selection agar (LBSA) and Violet Red Bile agar (VRBA) (Difco Laboratories, Franklin Lakes, NJ). The LBSA was prepared following the manufacturer's (BBL Microbiology Systems, Cockeysville, MD) formulation. The LBSA plates were incubated at 37℃ for 48 hours in a carbon dioxide inc ubator (VWR International, West Chester, PA). The VRBA plates were incubated at 37℃ for 24 hours.

Enrichments:

Fecal enrichment cultures for detection of *Salmonella* and *Campylobacter* were performed weekly for each pig. *Salmonella* enrichment was performed by aseptically transferring 1 mL of the 1:100 dilution prepared during plating (one from the filter bag) to 10 mL of sterile tetrathionate (TT), hajna broth (Difco Laboratories, Franklin Lakes, NJ) (Downes and Ito 2001). The broth was incubated for 18-24 hours at 37°C and placed at 2-5°C until the enrichment could be tested on the Bax® System (DuPont Qualicon, Wilmington, DE), which was no longer than four hours.

Enrichment of *Campylobacter* was done by aseptically transferring one gram of fresh feces to a sterile Whirl-Pack filter bag, adding 100 mL of sterile Bolton broth (Oxoid, Lenexa, KS) and stomaching as described earlier. The Bolton broth was supplemented with the following antibiotics in accordance to the Bacteriological Analytical Manual: 20 mg/L of sodium cefoperazone (Sigma-Aldrich, St. Louis, MO), 20 mg/L of trimethoprim lactate (Sigma-Aldrich, St. Louis, MO), 20 mg/L of vancomycin (Sigma-Aldrich, St. Louis, MO), and 2 mg/L of amphotericin B (Sigma-Aldrich, St. Louis, MO) (Hunt et al. 2001). After stomaching, the fecal solution was aseptically transferred to sterile 600 mL tissue culture flasks with 0.2 µm vented caps (BD, Franklin Lakes, NJ). The enrichment cultures were incubated according to the method described by Reilly and Gilliland (Reilly and Gilliland 2003). The cultures were incubated for 1-2 hours at 37°C followed by 20-24 hours at 42°C (Downes and Ito 2001). After enrichment, the fecal samples were stored at 2-5°C until tested on the Bax® System, which was fewer than four hours.

Carried out on only experiment two of study two was enrichment of *E. coli* O157:H7. One gram of feces was aseptically transferred to 10 mL of supplemented Gram negative (GN), hajna broth (Difco Laboratories, Franklin Lakes, NJ). The added supplements were the following: 50 ng/mL cefixime (Sigma-Aldrich, St. Louis, MO), 8 µg/mL vancomycin (Sigma-Aldrich, St. Louis, MO), and 10 µg/mL cefsulodin (Sigma-Aldrich, St. Louis, MO) (Cuesta Alonso et al. 2007). Samples were incubated for 18-24 hours at 37°C. The enriched samples were placed at refrigeration (2-5℃) temperatu re for no longer than four hours until further use on the Bax® System.

Bax® System:

All of the enrichment samples were tested on the Bax® System in accordance to the manufacturer's instructions. *Salmonella* enrichments were done using the *Salmonella* Bax® System PCR Assay kit (Dupont Qualicon, Wilmington, DE). *Escherichia coli* O157:H7 MP Bax® System PCR Assay kit (Dupont Qualicon, Wilmington, DE) was used for the *E. coli* O157:H7 enrichments. Real-time polymerase chain reaction (PCR) was performed on the *Campylobacter* enrichments using the *Campylobacter jejuni/coli/lari* Bax® System PCR Assay kit (Dupont Qualicon, Wilmington, DE). The *Salmonella* and *E. coli* O157:H7 kits only revealed if the sample was positive or negative for the pathogen. However, the *Campylobacter* kit confirmed a positive, the species present, and the estimated concentration (cfu/mL).

Confirmation of *Salmonella* positives were verified by streaking the presumptive positive enrichment cultures for isolation on XLT4 agar (Difco

Laboratories, Franklin Lakes, NJ). A confirmed *Salmonella* colony appeared black on the XLT4 agar. The enrichments that were positive for *E. coli* O157:H7 were subcultured three consecutive times in 10 mL of the supplemented GN broth at 37°C for 18 hours. In accordance to Cuesta Alonso et al. (Cuesta Alonsa et al. 2007) samples were immunoconcentrated on the mini Vidas system using the Vidas I.C.E. coli O157 kit (bioMérieux, France). The immunoconcentrated samples were spread plated on sorbitol MacConkey agar (SMAC) (Difco Laboratories, Franklin Lakes, NJ) and Chrom O157 agar (Chrom) (Chromagar Microbiology, Paris, France). The SMAC agar was supplemented with 50 µg/mL cefixime (Sigma-Aldrich, St. Louis, MO) and 2.5 µg/mL potassium tellurite (MP Biomedicals, Solon, OH). The antibiotics that were added to the Chrom agar were cefixime (0.025 µg/mL) (Sigma-Aldrich, St. Louis, MO), cefsulodin (5 µg/mL) (Sigma-Aldrich, St. Louis, MO), and potassium tellurite (2.5 µg/mL) (MP Biomedicals, Solon, OH). Assumptive *E. coli* O157:H7 colony positives on SMAC appear colorless and appear mauve on Chrom. The colonies from the SMAC and Chrom were identified as *E. coli* O157:H7 positives by testing for the O157 and H7 antigens with Remel's agglutination test kits (Lenexa, KS).

BLOOD COLLECTION AND BLOOD CHEMISTRY ANALYSIS:

Blood samples from the pigs were collected on day 0 and weeks 1, 2, and 3. The day 0 sampling periods were used as the baseline for all weekly blood chemistry tests. Blood was drawn from the anterior vena cava using 10 mL sterile serum vacutainers (BD, Franklin Lakes, NJ). The blood samples were placed on ice after collection and then refrigerated (2-5℃) overnight.

The samples were centrifuged for 10 minutes at 3,000 x g to separate the plasma from the serum. The serum was collected using a plastic transfer pipet and dispensed into seven appropriately labeled cryogenic vials per sample. The vials were stored at -20℃ until further analyses.

Blood serum samples were analyzed for complete metabolic profile and lipid panel by the Stillwater Medical Hospital laboratory using a Vitros 5,1 FS Chemistry System (Ortho-Clinical Diagnostics, Raritan, NJ) (Table 2).

***ESCHERICHIA COLI* LIPOPOLYSACCHARIDE (LPS) CHALLENGE:**

At the end of each 21 day experiment, each pig was subjected to a lipopolysaccharide (LPS) challenge to test the immune response. The LPS source was *Escherichia coli* O111:B4 (Sigma-Aldrich, Co., St. Louis, MO) that was suspended in 9 g/L of sterile saline for a final concentration of 25 µL/kg of body weight. The pigs were fasted for approximately 8 hours before the administration of LPS and were between 55 – 69 days of age. Before the LPS challenge, rectal temperature, body weight, and blood samples were taken from each pig (hour 0). Pigs were injected at 5 minute intervals into the intraperitoneal cavity in the lower abdomen with the weight-dependent LPS suspension. Besides the hour 0 readings that were recorded, rectal temperatures and blood was taken at hours 1.5, 3.0, 6.0, 12, and 24 at 5 minute intervals. In addition to the hour 0 body weight, weights were obtained at hours 6.0, 12, and 24. The pigs were fed 0.91 kg (2.0 lb) of feed after the 12 hour reading. The wasted/uneaten feed was dried and weighed to calculate feed intake. Blood was drawn, handled, and transferred as described earlier. The vials were stored at -20℃ until blood chemistry analyses were done as previously explained.

<u>Immunoglobulin Analysis</u>:

All blood serum samples were analyzed for immunoglobulins A (IgA), G (IgG), and M (IgM). To test the concentrations of the immunoglobulins, an enzyme linked immunosorbent assay (ELISA) quantization kit was used (Bethyl Laboratories, Inc., Montgomery, TX). Serum samples were analyzed following the manufacturer's instructions.

<u>Statistical Analysis</u>:

All weekly and LPS challenge blood chemistry and serum immunoglobulin data were analyzed using a repeated measures analysis of variance (ANOVA) by means of the SAS software (SAS Institute, 2003). The first-order autoregressive covariance structure was implemented. Slice effect was used to test for any differences between treatments at different time points. Rectal temperatures from the LPS challenge were also analyzed in the exact manner. When there was a significant difference at day 0, a covariate was adopted. Differences were considered significant at the $p<0.05$ level. Pairwise differences were used when there was a significant difference.

The Fischer's exact test, using the SAS Software (SAS Institute, 2003), was used to evaluate the data from the fecal samples before and after enrichment for *Campylobacter*. Samples were considered positive for

Campylobacter if they were positive for any of the three species using the Bax® System and *Campylobacter jejuni/coli/lari* PCR Assay kit.

Using the SAS Software (SAS Institute 2003), a Proc Mixed ANOVA was utilized to analyze the performance data, which included average daily feed intake (weekly and LPS challenge), average daily gain (weekly and LPS challenge), feed:gain (weekly and LPS challenge), and LPS challenge weights. A slice effect was used to test for any differences in treatments among study. A significant difference was observed when $p<0.05$. When a significant difference was observed, pairwise differences were used to examine differences among treatments. Data for numbers of fecal lactobacilli, fecal coliforms, and fecal *Campylobacter* counts using the Bax® System were analyzed in the same manner. The microbial counts were transposed into $\log_{10}$ cfu/g or mL before statistics were done

Table 1. Composition of swine diet

Feed Stuffs	Amount (lb)
Corn grain	642.48
Soybean meal	292.60
L-Lysine HCl	1.90
L-Threonine	0.50
DL-Methionine	0.20
Soybean oil	30.00
Dicalcium phosphate	14.22
Limestone, ground	8.84
Sodium chloride	5.00
OSU Trace Mineral Mix[a]	1.50
OSU Vitamin Mix[a]	2.50
Ethoxyquin	0.25
TOTAL	1000.00

[a]Vitamin and mineral mix (Oklahoma State University, Stillwater, OK)

Table 2. Blood chemistry analysis[a]

Analytes Tested	Units
Glucose	mg/dL
BUN[b]	mg/dL
Creatinine	mg/dL
BUN:Creatinie ratio	
Sodium	mEq/L
Potassium	mEq/L
Chloride	mEq/L
Carbon dioxide	mEq/L
Anion gap	
Calcium	mg/dL
Total protein	g/dL
Albumin	g/dL
Globulin	g/dL
Albumin:Globulin ratio	
AST[c]	U/L
ALT[d]	U/L
ALKPhos[e]	U/L
Bili, total	mg/dL
Cholesterol	mg/dL
Triglycerides	mg/dL
HDL[f]	mg/dL
VLDL[g]	mg/dL

[a]Performed using a Vitros 5,1 FS Chemistry System (Stillwater Medical Center, Stillwater, OK)

[b]BUN - blood urea nitrogen

[c]AST - aspartate aminotransferase

[d]ALT - alanine aminotransferase

[e]ALKPhos - alkaline phosphatase

[f]HDL - high-density lipoprotein

[g]VLDL - very low-density lipoprotein

RESULTS

<u>SWINE CULTURES:</u>

<u>Culture Identification:</u>

The identities of the cultures from domestic swine (DS) and wild boar (WB) were based on characteristics reported in the 9th edition of Bergey's Manual of Determinative Bacteriology (Sneath et al., 1986). A total of 29 phenotypic characteristics were tested. The following cultures were identified as *L. reuteri*: DS-29, DS-31, DS-33, DS-35, DS-36, DS-37, DS-38, DS-39, WB-72, WB-74, WB-75, WB-76, and WB-78. The identity of *L. acidophilus* L-23 (Lee et al. 2001) was confirmed as well. (The phenotypic identification characteristics for all cultures are listed in Appendix A in Tables A1, A2, and A3.)

<u>Bile Tolerance Assay:</u>

The cultures of lactobacilli performed very similar in the bile tolerance assay with a range for the increases in A_{520nm} for hour 4 of 0.309 – 0.598 (Table 3). All of the cultures of *L. reuteri* performed better than *L. acidophilus* L-23. The culture that appeared to have the highest bile tolerance was *L. reuteri* DS-36. The bile tolerance (based on A_{520nm} data) of culture for study 1 feeding trial ranged from 0.309 to 0.557 and included cultures *L. acidophilus* L-23 (L-23), *L. reuteri* WB-74 (WB-74), WB-75 (WB-75), and DS-33 (DS-33). The ranges for study 2 were 0.430 to 0.598 and included cultures *L. reuteri* DS-36 (DS-36), DS-37 (DS-37), WB-72 (WB-72), and WB-76 (WB-76). (For the averages of the complete bile tolerance assay view Table A4 in Appendix A.)

<u>FEEDING STUDIES:</u>

Enumeration of Lactobacilli:

For both studies all of the treatments (milk with added lactobacilli), besides the control, met the target count of 8.00 log_{10} cfu/mL. The counts for study 1 DS-33 and L-23 counts remained fairly constant from day 0 to day 3 or 4 for each batch of milk prepared. Study 2 cultures DS-36 and DS-37 also were stable. However, in study 1 cultures WB-74 and WB-75 declined in viability by approximately 0.5 log cycle from day 0 to day 3 or 4. A decrease of 1.00 log cycle was observed for study 2 cultures WB-72 and WB-76. (See Table B1 in Appendix B and Table C1 in Appendix C for the treatment counts.)

Growth & Performance:

Beginning (day 0) and ending weights (week 3) in study 1 were measured to test growth. There was no overall treatment (P=0.9827) effect or treatment x experiment interaction (P=0.9675) for day 0. A significant experiment (P=0.0350) effect was seen where the pigs (barrows) in experiment 2 were heavier. However, there were no differences among treatments (P=0.7946) or a treatment x experiment interaction (P=0.8801). Study 2 beginning weights did not demonstrate a difference in treatment (P=0.9987), experiment (P=0.6364), or treatment x experiment interaction (P=0.9985). Week 3 did reveal a trend for the experiment (P=0.0703), but no treatment (P=0.8654) effect or treatment x experiment interaction (P=0.8849). The pigs in experiment 1 (gilts) in study 2 tended to be heavier than those in experiment 2 (barrows). (The weights are listed in Table B3 in Appendix B and in Table C3 in Appendix C.)

When analyzing the data from study 1, it was observed that during week 2 a control pig (# 13) was an outlier, thus we removed his data from the week 2 results of the growth and performance analyses. There was no overall treatment (P=0.5641) effect or treatment x experiment interaction (P=0.6176) for average daily gain (ADG). Numerically, the ADG for the group receiving the culture DS-33 was higher than the control group although the difference was not significant. There was a significant experiment (P=0.0099) effect where the pigs in experiment 2 (barrows) gained more weight than those in experiment 1 (gilts). The overall average daily feed intake (ADFI) did not reveal any significant differences for the treatment (P=0.6803) or treatment x experiment interaction (P=0.9127). Pigs fed culture DS-33 numerically consumed more feed than the control. There was a significant experiment (P=0.0473) effect where the barrows consumed more feed. Analysis of data for feed efficiency did not reveal any differences among the treatments (P=0.1078) or treatment x experiment interaction (P=0.1022), but a experiment (P=0.0001) effect was observed. Numerically, culture DS-33 caused the most efficient feed to gain (F:G). Pigs in experiment 1 (barrows) had a better overall F:G than those in experiment 2 (gilts). There was a trend (P=0.0667) in the experiment 1, but not in experiment 2 (P=0.1667), where some of the treatments had a more efficient F:G than the control. The cultures of lactobacilli that caused a better F:G were L-23, DS-33, and WB-75 although the differences were not significantly different (P>0.05) (Table 3). (The raw data for growth and performance are in Tables B4, B5, B6, and B7 in Appendix B.)

Data for ADG in study 2 did not reveal a treatment (P=0.3507) effect or treatment x experiment interaction (P=0.3432). However, numerically culture DS-36 caused a greater ADG than the control group. A experiment (P<0.0001) effect was observed where experiment 1(gilts) gained more weight than experiment 2 (barrows). There was an overall experiment (P<0.0001) effect for ADFI, but no differences were found in the treatment (P=0.3218) effect or the treatment x experiment interaction (P=0.8559). The pigs in experiment 1 (gilts) gained more weight throughout the entire study. The treatment DS-36 numerically had a higher ADFI than the control. There was not an overall treatment (P=0.5542) effect, but there was a experiment (P=0.0055) and treatment x experiment interaction (P=0.0352) for feed efficiency. The barrows F:G was better than gilts. A treatment (P=0.0318) effect was observed in the barrows. In this case, DS-37 treatment F:G was poorer than the control and other cultures of lactobacilli. A experiment (P=0.0145) effect, a treatment x experiment interaction (P=0.0145), and a treatment (P=0.0642) trend at week 1 was noticed. The control group performed poorer than DS-36, WB-72, and WB-76 groups. The gilts were more efficient in converting feed to gain. A treatment (P=0.0011) effect was observed in the barrows. The culture DS-37 had an inferior F:G compared to the control and other DFM treatments (Table 4). (The raw growth and performance data is in Appendix C in Tables C4, C5, C6, and C7.)

Microbial Analysis of Feces:

No significant effects of any treatments on numbers of coliform or total facultative lactobacilli were found for either study. There was an exception. Study 2 had a week 2 treatment (P=0.0454) effect where culture WB-76 was significantly lower than the control group. There also was no effect of any treatment on number of *Campylobacter* in the fecal material for either study. In most cases the numbers, if present, were below the detection level for direct plating. (The counts for the study 1 see Tables B8, B9, and B10 in Appendix B and Tables C8, C9, and C10.)

For both studies, enrichment cultures for the detection of *Campylobacter* revealed that all treatments had positive carriers for *C. coli*, but not for *C. jejuni* or *lari*. No trend was observed throughout the studies for the incidence of positives confirmed with Bax® System. Also, none of the pigs in study 1 were confirmed *Salmonella* positive. There were only two pigs confirmed positive for *Salmonella* in study 2. The enrichment tests for *Escherichia coli* O157:H7 did not reveal any to be positive. Thus, there were not sufficient numbers or positive samples to enable any observed effect of feeding the lactobacilli. (For the results of the Bax® positives, see Appendix B in Tables B11, B12, and B13 and Appendix C in Tables C11, C12, C13, and C14.)

Serum Blood Chemistry:

Compared to the control group for either study none of the cultures caused significant ($p>0.05$) changes in the following blood serum levels: glucose, blood urea nitrogen (BUN), creatinine, BUN:creatinine ratio, sodium, potassium, chloride, carbon dioxide, calcium, albumin, globulin, albumin:globulin ratio, alanine aminotransferase (ALT), alkaline phosphatase (ALKPhos), total bili, cholesterol, triglycerides, high-density lipoprotein (HDL), and very low-density lipoprotein (VLDL). (Raw data for blood chemistry analytes are in Tables B14-B35 in Appendix B and Tables C15-C36 in Appendix C.)

In study 1, there was a significant treatment (P=0.0067) and week (P<0.0001) effect on total serum protein, but no treatment x week interaction (P=0.4121). Culture DS-33 caused the lowest amount of serum protein, but it was not different than the control group. However, culture L-23 resulted in the highest overall mean serum protein compared to the control (P<0.05). An increase for total protein was observed over time for all treatments and the control. There were differences in treatments (P=0.0101) at week 3. The groups that were fed the cultures WB-74 and L-23 exhibited higher (P<0.05) serum protein than did the group fed DS-33. The control and WB-75 groups were the same and not different from the cultures DS-33, L-23, or WB-74 (P<0.05). Even though there were effects on total serum protein, there were no significant differences in levels of albumin or globulin. In study 2, there was no treatment (P=0.9096) effect for total protein or treatment x week interaction (P=0.6131), but a week (P<0.0001) effect was observed. Numerically the groups fed the cultures DS-36, WB-72, and WB-76 had overall higher total serum protein than the control group (Table 5).

For study 1, there was an overall significant treatment (P=0.0181) and week (P<0.0001) effect for serum aspartate aminotransferase (AST). Treatment x week interaction (P=0.1715) was not significant. The group fed the culture DS-

33 exhibited significantly lower AST than did the control and other groups, except WB-74. The highest numerical AST level was observed in L-23, but it was not different from the control. A significant treatment (P=0.0008) effect was revealed at week 1. The results were the same for week 1 as seen in the overall treatment effect. Therefore, DS-33 group had the lowest level with no differences between it and the group fed WB-74. The treatment with the highest level was the group fed L-23, but there was no difference between it and the control. There were no differences in AST levels among treatments (P=0.9356) or treatment x week interaction (P=0.7318) for study 2. A significant week (P=0.0411) effect was observed. The group fed the culture DS-36 had a much higher level of AST on day 0 than the control group and other treatment groups, but it dropped drastically by the end of week 1 (Table 6).

Serum Immunoglobulins:

No significant treatment effects were observed on immunoglobulin A (IgA) for either study. There was a trend toward higher IgA levels in the groups fed culture L-23, WB-74, or WB-75 than for the control group (P=0.1116) in study 1. A numerical difference was observed at week 1. The groups fed WB-74 or WB-75 showed an increased change in IgA while the control group decreased. All of the treatment and control groups exhibited increases in IgA by week 3 compared to week 2. In study 2 all the treatment and control groups had increased IgA at week 1 with pigs fed culture WB-76 causing the highest increase (Figure 1).

No treatment differences for study 1 or 2 were observed for levels of serum immunoglobulin G (IgG). In study 1 pigs fed L-23 had an overall higher

IgG level than the control group. The increases for the group fed culture L-23 were consistently higher than any of the groups. The control group exhibited little change during the entire feeding study. In study 2 none of the cultures caused greater increases in IgG than the control group. The serum levels DS-37, DS-36, and WB-71 decreased some during week 1; however, that for WB-76 did not. After week 1, all of the treatment and control groups increased until the end of the feeding trial. At the end of the study culture DS-37 exhibited a slightly higher change than the control group (Figure 2).

No effect was observed for serum immunoglobulin M (IgM) for either study. At week 1, in study 1 culture, WB-74 was the only treatment that exhibited an increased change. Just as observed for the IgA levels, the IgM levels for the control group remained fairly constant. Cultures WB-74, WB-75, and L-23 caused increased changes at week 3. In study 2 the cultures DS-37, WB-72, and WB-76 had an increased change at week 1 with culture WB-72 having the largest increase. This trend continued to week 2 with the pigs fed culture WB-72 still exhibiting the largest increase. Throughout the entire study the control demonstrated little change in IgM levels (Figure 3).

LIPOPOLYSACCHARIDE (LPS) CHALLENGE:

Rectal Temperatures:

An overall hourly ($P<0.0001$) effect was observed for rectal temperatures for both studies, but there was no treatment effect or treatment x hour interaction. The temperatures increased from hour 0 to hour 3.0. The temperatures started to fall after hour 3.0 and continued to decrease until hour 12 (Figure 4).

Serum Blood Chemistry:

There were very few significant differences for the blood analytes observed during the LPS challenge. There were no overall differences for treatment or treatment x hour interaction for the following: glucose, BUN, creatinine, BUN:creatinine ratio, sodium, potassium, chloride, carbon dioxide, anion gap, calcium, total protein, albumin, albumin:globulin ratio, AST, ALT, cholesterol, and HDL. (All of the LPS challenge blood analytes are listed in Tables B42-B63 in Appendix B and Tables C43-C64 in Appendix C.)

While there were no treatment differences in study 1 for serum globulin levels during the LPS challenge, numerically, culture WB-74 caused a higher serum globulin average than observed for the control group. For study 2 an overall treatment ($P=0.0462$) and hour ($P<0.0001$) effect was noticed for serum globulin levels, but there was no treatment x hour interaction ($P=0.9994$). The control group exhibited a higher level than the pigs fed DS-36 (Table 7).

There were no overall significant treatment differences observed for studies 1 and 2 for albumin:globulin ratio. In study 1, the overall ratios for pigs fed cultures of lactobacilli were numerically higher than the control group. This also was true for each hourly measurement. At 3.0 hour post challenge, pigs fed cultures DS-36 and WB-76 had higher ratios than the control pigs in study 2 ($P<0.05$) (Table 8). These cultures continued to exhibit higher ratios (although not significant) than the control group throughout the challenge (Table 8).

Levels of bilirubin (bili) in serum LPS challenge were not significantly influenced by treatments in either study, but there was an hour ($P<0.0001$) effect.

In study 1, the culture DS-33 caused a numerically lower bili average than the control group at each time beyond hour 3.0. Levels of bili in study 2 tended to be lower in pigs fed culture DS-37 than the control group. Culture DS-37 caused a significantly ($P<0.05$) lower total bili level than the control group at hour 12 (Table 9).

Serum triglycerides in study 1 were not significantly influenced by any treatment. Values for the control group tended to be higher than all of the groups fed cultures of lactobacilli. Study 2 revealed a trend toward treatment ($P=0.1105$) and an hourly ($P<0.0001$) effect with no treatment x hour interaction ($P=0.9349$). The control group had an overall higher triglyceride level than all of the direct-fed microbial cultures. At 12 hour post challenge, the control group was significantly ($P=0.0093$) higher than pigs fed cultures DS-36, DS-37, and WB-72 with the DS-37 group exhibiting the lowest level (Table 10).

A treatment effect for study 1 was not observed for serum VLDL. There was no treatment x hour interaction ($P=0.9490$), but a treatment ($P=0.1105$) trend and hourly ($P<0.0001$) effect for study 2. The control group had a higher VLDL average than all of the cultures of lactobacilli with this trend continuing for every hourly reading. A significant treatment ($P=0.0128$) effect was observed at hour 12 where the control group was higher than pigs fed DS-37 (Table 11).

Serum Immunoglobulins:

Serum IgA for study 1 or 2 was not significantly affected by treatment. An hourly ($P=0.0002$) effect was observed for study 1. The pigs fed L-23, at hours 1.5 and 3.0, were the only ones that exhibited an increased change in IgA. In study 2 there was an hourly (P<0.0001) effect on levels of IgA and a treatment x hour interaction (P=0.0128). At hours 1.5, 3.0, and 6.0 the culture DS-36 had a larger increased change than the control group (Figure 5).

No treatment effect for levels of serum IgG in either study was observed, but both exhibited an hourly (P<0.0001) effect (Figure 6). All pigs showed a decrease in IgG levels at hour 1.5. Pigs fed L-23 tended to have a higher level of IgG than the control pigs at hour 6.0 in study 1. Culture WB-76 from study 2 was the only culture that caused an apparent increase at hour 1.5 while all the others exhibited a decrease in IgG (Figure 6).

No significant treatment differences in either study were observed for serum IgM. Both studies did have an hour (P<0.0001) effect. Culture L-23 numerically had a higher IgM average than the control group. In study 1, the levels of IgM dropped at hour 1.5 for all treatment and control groups. However, at hour 3.0 pigs fed L-23 caused a larger increased change than the control pigs. In study 2, pigs fed culture WB-76 was the only group that exhibited an increased change at hour 1.5 (Figure 7).

Table 3. Comparisons of bile tolerance of different cultures of lactobacilli[a]

Isolate	Rep 1[b]	Rep 2[b]	Mean
L. reuteri DS-29	0.575	0.512	0.544
L. reuteri DS-31	0.550	0.516	0.533
L. reuteri DS-33	0.598	0.516	0.557
L. reuteri DS-35	0.536	0.500	0.518
L. reuteri DS-36	0.653	0.542	0.598
L. reuteri DS-37	0.463	0.397	0.430
L. reuteri DS-38	0.542	0.478	0.510
L. reuteri DS-39	0.576	0.481	0.529
L. reuteri WB-72	0.702	0.436	0.569
L. reuteri WB-74	0.577	0.397	0.487
L. reuteri WB-75	0.650	0.388	0.519
L. reuteri WB-76	0.685	0.427	0.556
L. reuteri WB-78	0.643	0.366	0.505
L. acidophilus L-23	0.354	0.263	0.309

[a]In deMan, Rogasa, Sharpe (MRS) broth + 0.3% oxgall

[b]Values are increases in A_{620nm} after hour 4 at 37℃

Table 4. Growth and performance of nursery pigs fed different cultures of lactobacilli

Study[a]	Treatment[a]	Experiement[a]	ADG[b] (kg)	ADFI[c] (kg)	F:G[d]
1	Control	1	0.53	0.93	1.68
		2	0.52	0.88	1.69
		Mean	0.53	0.91	1.69
	DS-33	1	0.68	1.09	1.52
		2	0.53	0.93	1.77
		Mean	0.60	1.01	1.65
	WB-74	1	0.57	1.02	1.75
		2	0.51	0.93	1.84
		Mean	0.54	0.98	1.80
	WB-75	1	0.61	1.01	1.59
		2	0.46	0.88	1.90
		Mean	0.54	0.94	1.74
	L-23	1	0.60	0.98	1.57
		2	0.53	0.93	1.78
		Mean	0.56	0.96	1.68
2	Control	1	0.36	0.57	1.59[y]
		2	0.50	0.88	1.69
		Mean	0.43	0.71	1.64
	DS-36	1	0.40	0.63	1.57[y]
		2	0.55	0.93	1.71
		Mean	0.47	0.78	1.64
	DS-37	1	0.29	0.52	1.77[z]
		2	0.53	0.88	1.66
		Mean	0.41	0.70	1.72
	WB-72	1	0.35	0.55	1.56[y]
		2	0.49	0.86	1.76
		Mean	0.42	0.71	1.66
	WB-76	1	0.38	0.59	1.56[y]
		2	0.50	0.88	1.75
		Mean	0.44	0.73	1.65

[a]Description of treatments for study 1: control, *L. reuteri* DS-33, *L. reuteri* WB-74, *L. reuteri* WB-75, and *L. acidophilus* L-23. Experiment 1 - barrows and experiment 2 - gilts, n=15 pigs/rep. Description of treatmentsfor study 2: control, *L. reuteri* DS-36, *L. reuteri* DS-37, *L. reuteri* WB-72, and *L. reuteri* WB-76. Experiment 1 - gilts and experiment 2 - barrows, n=15 pigs/experiment

[b]ADG - average daily gain

[c]ADFI - average daily feed intake

[d]F:G - feed to gain ratio

[y,z]Values for F:G in study 2 followed by different subscript letters differ significantly (P<0.05).

Table 5. Influence of different cultures of lactobacilli on weekly serum total protein (g/dL)

Study[a]	Treatment[a]	Day 0	Week 1	Week 2	Week 3	Mean
1	Control	4.8	4.4	4.6	$5.2^{y,z}$	$4.8^{x,y}$
	DS-33	4.4	4.5	4.8	4.9^{y}	4.6^{x}
	WB-74	4.6	4.5	4.9	5.6^{z}	$4.9^{y,z}$
	WB-75	4.7	4.5	4.7	$5.2^{y,z}$	$4.8^{x,y}$
	L-23	4.7	4.9	5.0	5.6^{z}	5.1^{z}
2	Control	4.6	4.6	5.0	5.1	4.8
	DS-36	4.9	4.5	5.0	5.1	4.8
	DS-37	4.5	4.6	5.1	5.0	4.8
	WB-72	4.8	4.7	5.0	5.2	4.9
	WB-76	4.8	4.4	5.3	5.2	4.9

[a]Description of treatments see Table 4

[x,y,z]Values in different columns in study 1 followed by different subscript letters differ significantly (P<0.05).

Table 6. Influence of different cultures of lactobacilli on weekly serum AST[a] (U/L)

Study[b]	Treatment[b]	Day 0	Week 1	Week 2	Week 3	Mean
1	Control	68	71[y,z]	49	51	60[y,z]
	DS-33	54	50[x]	52	45	50[x]
	WB-74	62	58[x,y]	47	55	55[x,y]
	WB-75	64	80[z]	52	52	62[y,z]
	L-23	73	77[z]	52	62	66[z]
2	Control	81	73	70	52	69
	DS-36	138	60	56	49	76
	DS-37	68	68	74	52	65
	WB-72	90	63	64	48	66
	WB-76	69	67	66	62	66

[a]AST - aspartate aminotransferase

[b]Description of treatments see Table 4

[x,y,z]Values in different columns in study 1 followed by different subscript letters differ significantly (P<0.05).

Table 7. Influence of different cultures of lactobacilli on LPS[a] challenge serum globulin (g/dL)

Study[b]	Treatment[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24	Mean
1	Control	2.0	1.8	1.7	1.9	2.0	2.0	1.9
	DS-33	1.7	1.6	1.5	1.7	1.8	1.9	1.7
	WB-74	2.1	2.0	1.8	2.0	2.0	2.1	2.0
	WB-75	1.8	1.6	1.7	1.8	1.8	1.9	1.8
	L-23	2.1	1.9	1.8	1.9	2.0	1.9	1.9
2	Control	2.1	1.9	2.3	2.1	2.0	2.1	2.1[z]
	DS-36	1.9	1.7	2.0	1.7	1.7	1.8	1.8[y]
	DS-37	2.1	2.0	2.3	1.9	1.9	2.0	2.0[z]
	WB-72	2.0	1.9	2.2	1.7	1.8	1.9	1.9[y,z]
	WB-76	2.0	1.9	2.1	1.8	1.9	1.9	1.9[y,z]

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments see Table 4

[y,z]Values for globulin mean in study 2 followed by different subscript letters differ significantly (P<0.05).

Table 8. Influence of different cultures of lactobacilli on LPS[a] challenge serum albumin:globulin ratio

Study[b]	Treatment[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24	Mean
1	Control	1.6	1.4	1.4	1.5	1.4	1.4	1.5
	DS-33	1.9	1.8	1.6	1.8	1.7	1.6	1.7
	WB-74	1.8	1.6	1.4	1.6	1.5	1.4	1.6
	WB-75	1.9	1.8	1.6	1.7	1.7	1.6	1.7
	L-23	1.8	1.6	1.6	1.8	1.7	1.5	1.7
2	Control	1.4	1.4	1.6[y]	1.5	1.4	1.3	1.4
	DS-36	1.8	1.7	2.0[z]	1.8	1.7	1.7	1.8
	DS-37	1.4	1.4	1.6[y]	1.5	1.4	1.3	1.4
	WB-72	1.6	1.6	1.8[y,z]	1.7	1.6	1.5	1.6
	WB-76	1.6	1.6	1.9[z]	1.7	1.6	1.5	1.6

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments see Table 4

[y,z]Values for hour 3.0 albumin:globulin ratio in study 2 followed by different subscript letters differ significantly ($P<0.05$).

Table 9. Influence of different cultures of lactobacilli on LPS[a] challenge serum bili, total (mg/dL)

Study[b]	Treatment[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24	Mean
1	Control	0.15	0.18	0.25	0.33	0.78	0.10	0.30
	DS-33	0.18	0.18	0.13	0.29	0.57	0.13	0.25
	WB-74	0.17	0.18	0.18	0.38	0.80	0.25	0.33
	WB-75	0.18	0.17	0.20	0.42	0.63	0.12	0.29
	L-23	0.23	0.20	0.22	0.30	0.70	0.10	0.29
2	Control	0.12	0.10	0.22	0.25	0.62^{z}	0.12	0.24
	DS-36	0.22	0.13	0.28	0.28	$0.45^{y,z}$	0.10	0.24
	DS-37	0.13	0.15	0.20	0.13	0.28^{y}	0.12	0.17
	WB-72	0.10	0.18	0.25	0.12	0.53^{z}	0.12	0.22
	WB-76	0.20	0.17	0.20	0.20	0.53^{z}	0.18	0.25

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments see Table 4

[y,z]Values for hour 12 total bilirubin in study 2 followed by different subscript letters differ significantly (P<0.05).

Table 10. Influence of different cultures of lactobacilli on LPS[a] challenge serum triglycerides (mg/dL)

Study[b]	Treatment[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24	Mean
1	Control	31	25	23	21	59	33	32
	DS-33	29	31	21	22	56	41	33
	WB-74	34	36	30	30	63	51	41
	WB-75	37	30	24	28	82	38	40
	L-23	46	29	25	25	70	40	39
2	Control	44	37	45	36	70^{z}	45	46
	DS-36	35	32	38	28	$52^{x,y}$	36	37
	DS-37	38	34	37	22	38^{x}	34	34
	WB-72	35	32	38	24	$54^{x,y}$	33	36
	WB-76	41	31	39	24	$58^{y,z}$	34	38

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatment see Table 4

[x,y,z]Values for hour 12 triglycerides in study 2 followed by different subscript letters differ significantly (P<0.05).

Table 11. Influence of different cultures of lactobacilli on LPS[a] challenge serum VLDL[b] (mg/dL)

Study[c]	Treatment[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24	Mean
1	Control	6.0	5.0	4.3	4.2	11.8	6.5	6.3
	DS-33	5.8	6.3	4.0	4.3	11.2	8.2	6.6
	WB-74	6.8	7.0	6.0	6.0	12.7	10.0	8.1
	WB-75	7.5	5.8	4.8	5.8	16.3	7.8	9.0
	L-23	9.2	5.8	4.5	4.8	11.5	9.0	8.1
2	Control	8.7	7.7	9.0	7.2	13.8[z]	8.8	9.2
	DS-36	8.2	6.5	7.7	5.7	10.5[y,z]	7.5	7.5
	DS-37	8.5	6.8	7.5	4.5	7.7[y]	7.0	9.8
	WB-72	6.8	6.3	7.5	4.7	10.7[y,z]	6.7	7.1
	WB-76	8.3	6.2	7.7	5.0	11.5[z]	6.8	7.6

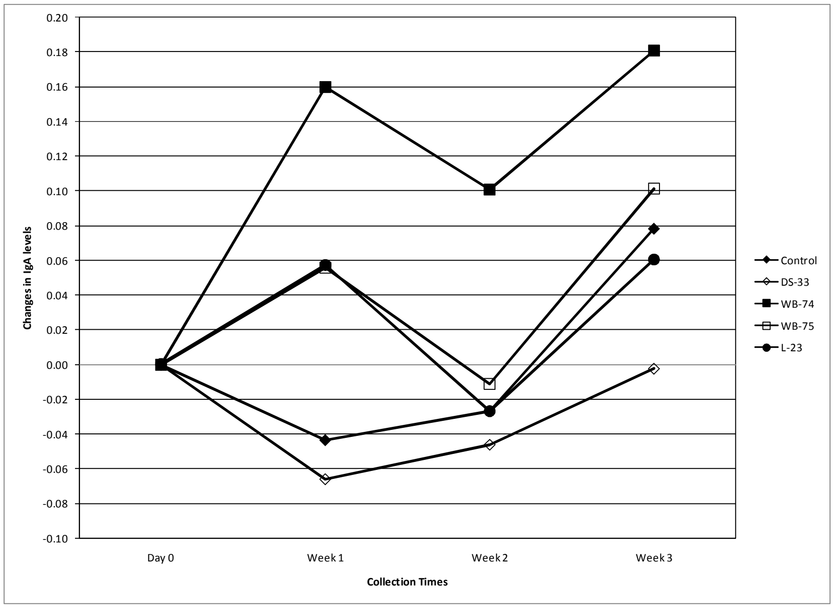
[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]VLDL - very low-density lipoprotein

[c]Description of treatment see Table 4

[x,y,z]Values for hour 12 VLDL in study 2 followed by different subscript letters differ significantly ($P<0.05$).

A



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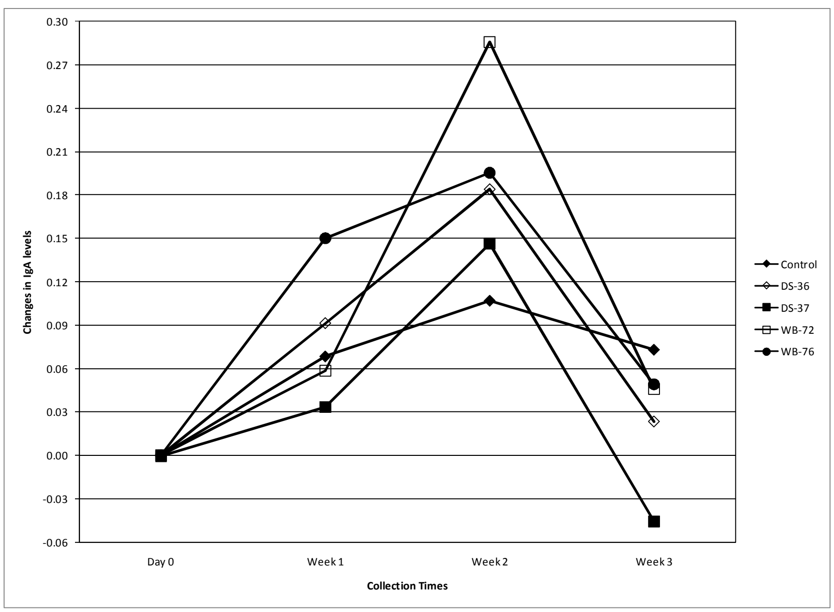


Figure 1. Changes in weekly serum IgA levels from day 0 in response to different cultures of lactobacilli. Six pigs per treatment and two experiments per study. A) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-33, ■ *L. reuteri* WB-74, □ *L. reuteri* WB-75, ● *L. acidophilus* L-23. B) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-36, ■ *L. reuteri* DS-37, □ *L. reuteri* WB-72, ● *L. reuteri* WB-76.

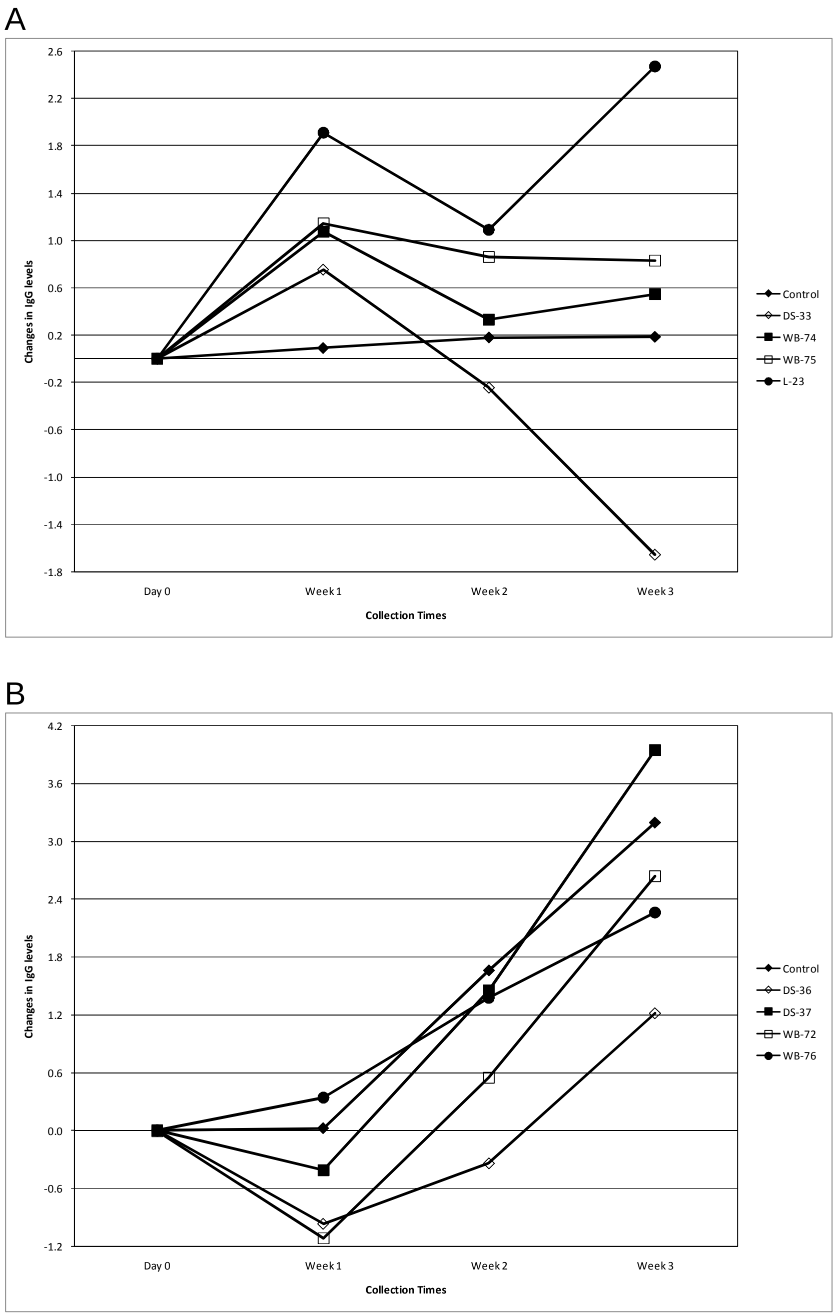
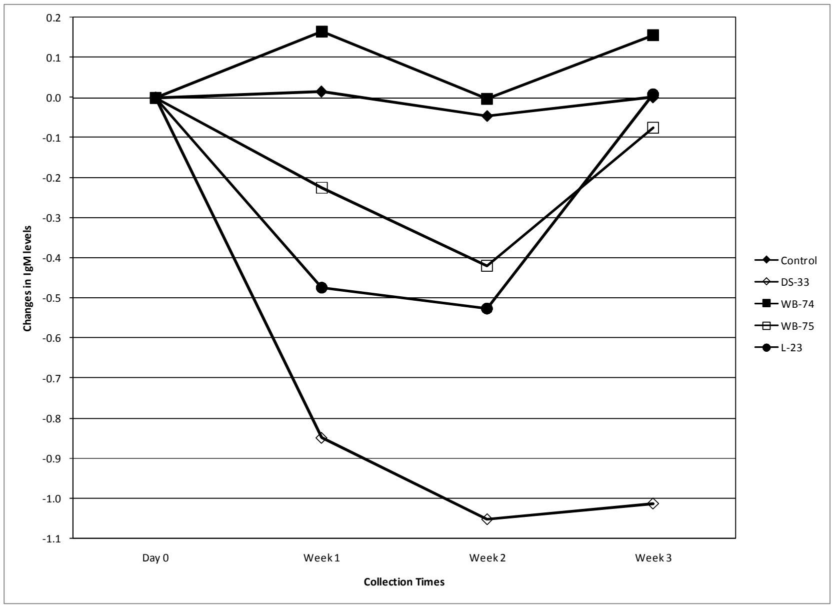


Figure 2. Changes in weekly serum IgG levels from day 0 in response to different cultures of lactobacilli. Six pigs per treatment and two experiments per study. A) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-33, ■ *L. reuteri* WB-74, □ *L. reuteri* WB-75, ● *L. acidophilus* L-23. B) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-36, ■ *L. reuteri* DS-37, □ *L. reuteri* WB-72, ● *L. reuteri* WB-76.

A



B

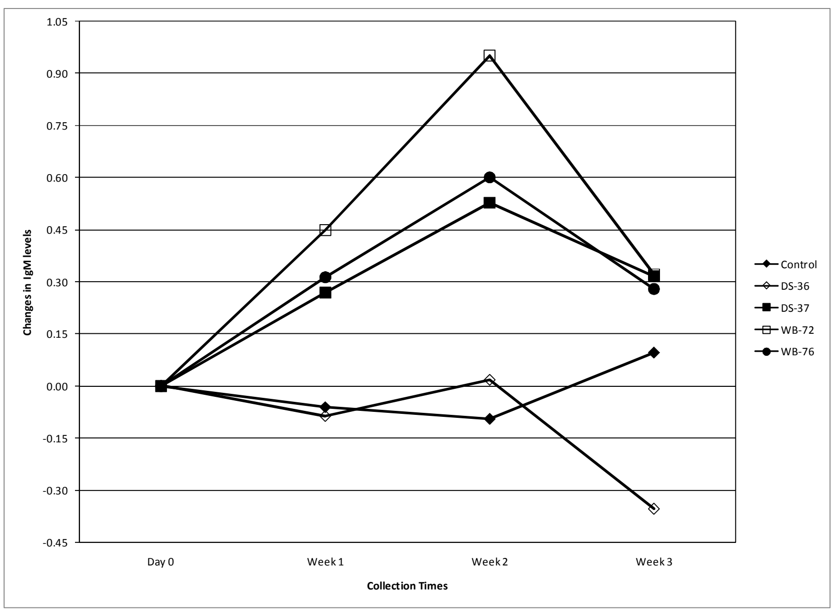


Figure 3. Changes in weekly serum IgM levels from day 0 in response to different cultures of lactobacilli. Six pigs per treatment and two experiments per study. A) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-33, ■ *L. reuteri* WB-74, □ *L. reuteri* WB-75, ● *L. acidophilus* L-23. B) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-36, ■ *L. reuteri* DS-37, □ *L. reuteri* WB-72, ● *L. reuteri* WB-76.

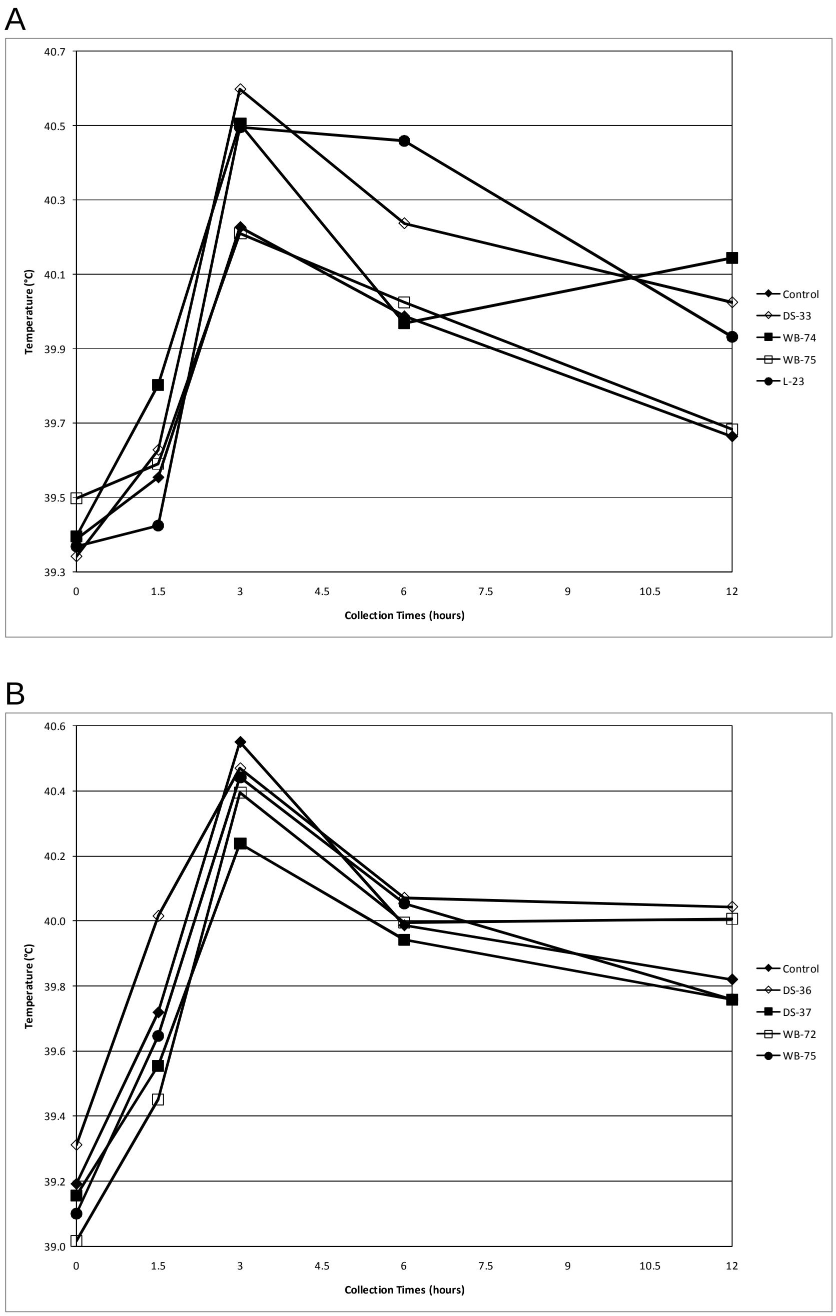
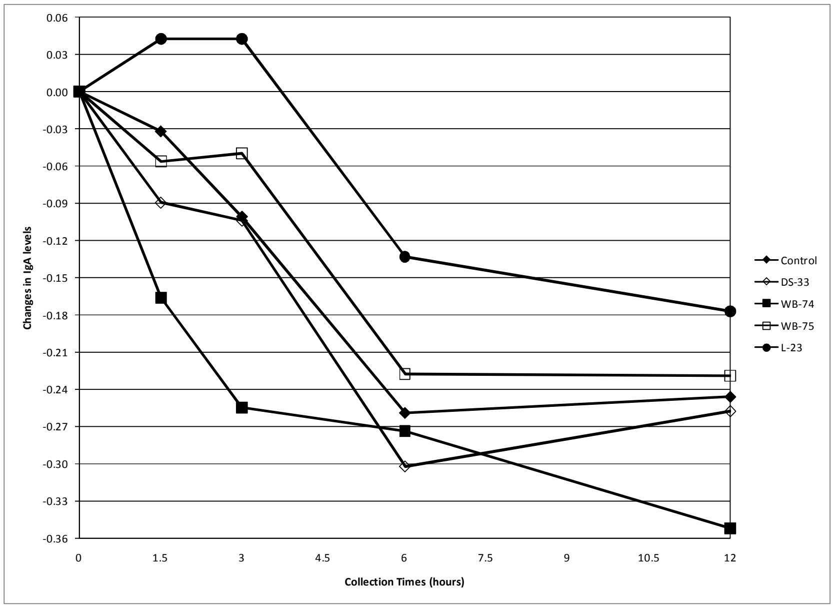


Figure 4. Rectal temperatures of different cultures of lactobacilli in response to *Escherichia coli* O111:B11 lipopolysaccharide. Six pigs per treatment and two experiments per study. A) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-33, ■ *L. reuteri* WB-74, □ *L. reuteri* WB-75, ● *L. acidophilus* L-23. B) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-36, ■ *L. reuteri* DS-37, □ *L. reuteri* WB-72, ● *L. reuteri* WB-76.

A



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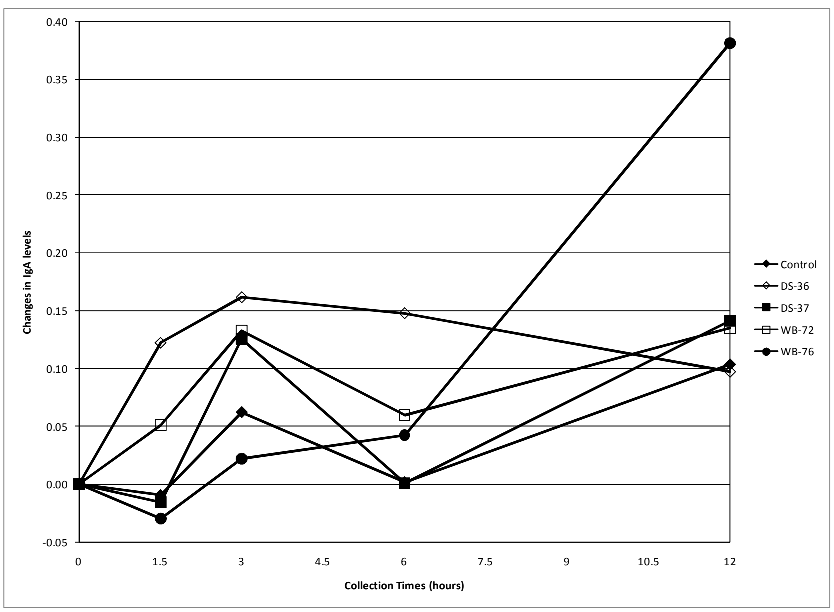
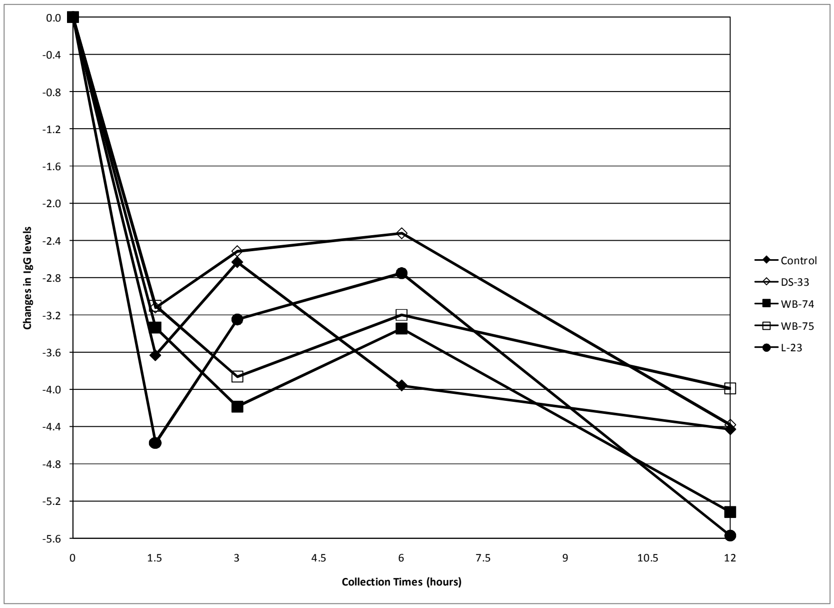


Figure 5. Changes in serum IgA levels from hour 0 of different cultures of lactobacilli in response to *Escherichia coli* O111:B11 lipopolysaccharide. Six pigs per treatment and two experiments per study. A) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-33, ■ *L. reuteri* WB-74, □ *L. reuteri* WB-75, ● *L. acidophilus* L-23. B) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-36, ■ *L. reuteri* DS-37, □ *L. reuteri* WB-72, ● *L. reuteri* WB-76.

A



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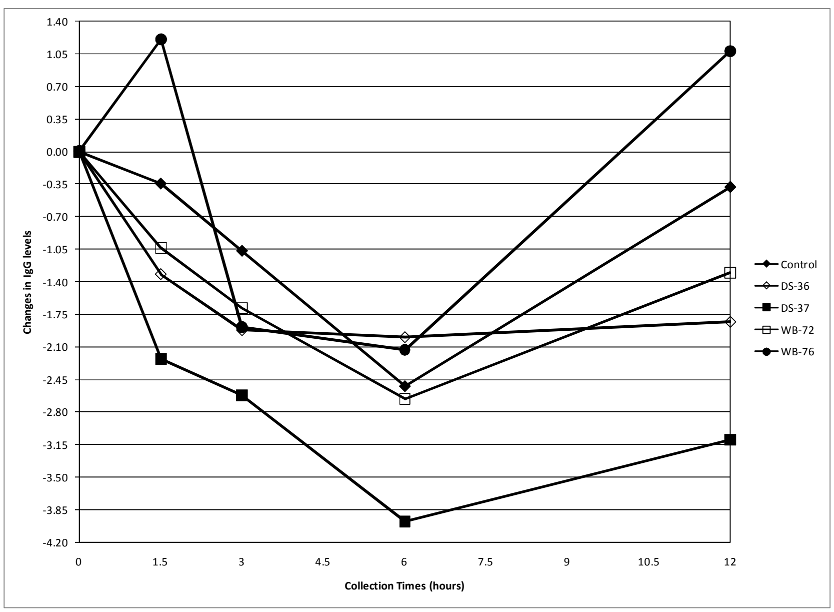
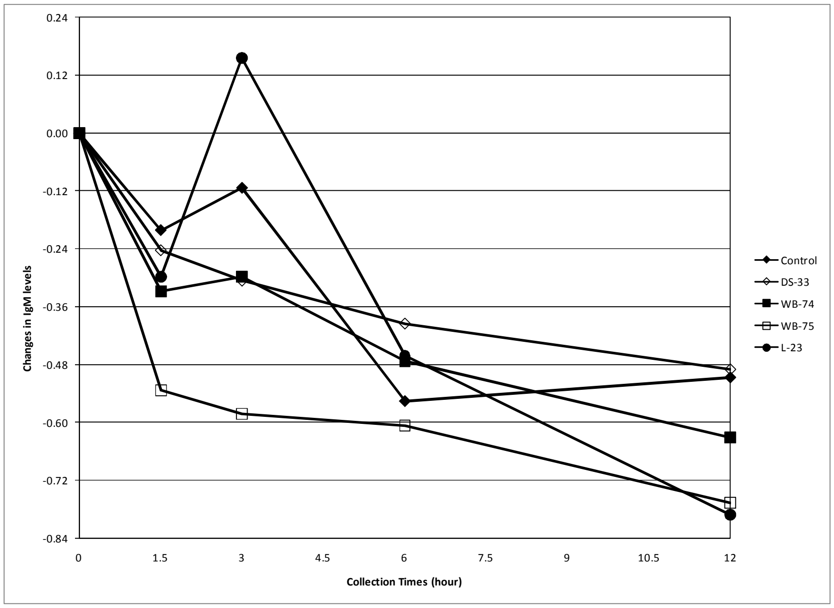


Figure 6. Changes in serum IgG levels from hour 0 of different cultures of lactobacilli in response to *Escherichia coli* O111:B11 lipopolysaccharide. Six pigs per treatment and two experiments per study. A) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-33, ■ *L. reuteri* WB-74, □ *L. reuteri* WB-75, ● *L. acidophilus* L-23. B) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-36, ■ *L. reuteri* DS-37, □ *L. reuteri* WB-72, ● *L. reuteri* WB-76.

A



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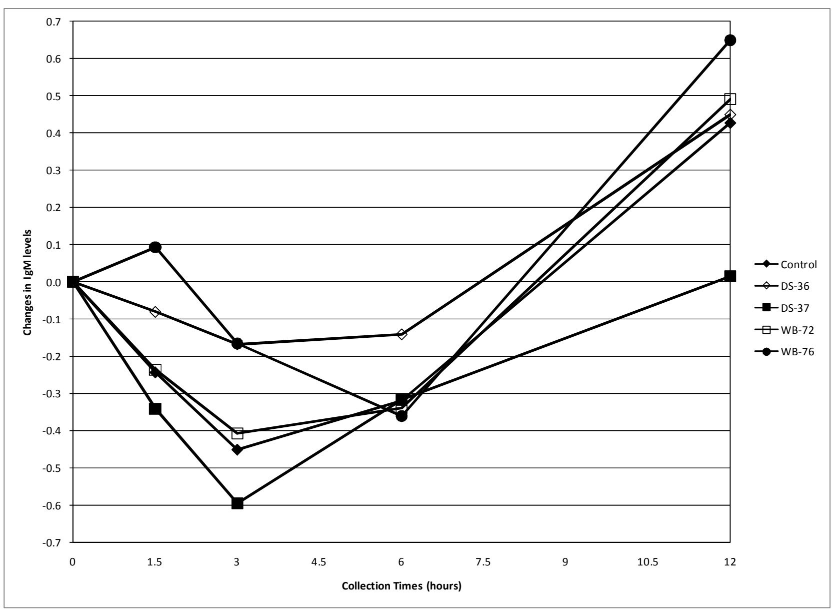

Figure 7. Changes in serum IgM levels from hour 0 of different cultures of lactobacilli in response to *Escherichia coli* O111:B11 lipopolysaccharide. Six pigs per treatment and two experiments per study. A) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-33, ■ *L. reuteri* WB-74, □ *L. reuteri* WB-75, ● *L. acidophilus* L-23. B) Treatment descriptions: ♦ control, ◊ *L. reuteri* DS-36, ■ *L. reuteri* DS-37, □ *L. reuteri* WB-72, ● *L. reuteri* WB-76.

DISCUSSION

<u>DIRECT-FED MICROBIALS FOR SWINE:</u>

Direct-fed microbials (DFM) offer several potential benefits for swine including: improved growth and performance, pathogen reduction, increased immunity, and less post-weaning stress. Some of the most commonly used DFM for swine are species of *Lactobacillus*, *Bifidobacteria*, *Enterococcus*, and *Saccharomyces* (Mountzouris 2006).

Lactobacillus acidophilus L-23 (L-23) was used for study 1 because it was shown to improve growth and performance in nursery pigs in previous studies. The culture was isolated from a pig from Oklahoma State University's swine herd. It produces amylase and is bile tolerant. The culture had improved average daily gain (ADG) and feed:gain (F:G) of weaning pigs on a high starch diet (Lee et al. 2001).

The cultures of *L. reuteri* used in this study were isolated from feces of open range pigs and from the small intestines of a wild boar. *Lactobacillus reuteri* is one of the first species of lactobacilli to colonize the intestines of pigs (Naito et al. 1995). The cultures from the domestic swine and wild boar were more bile tolerant than L-23. *Lactobacillus reuteri* DS-36 (DS-36) was the most bile tolerant followed by *L. reuteri* WB-72 (WB-72), DS-33 (DS-33), and WB-76 (WB-76). Because they appeared more bile tolerant than the other cultures, they were chosen for the studies. A previous study revealed, of cultures tested, the more bile tolerant lactobacilli, fed to newborn calves resulted higher levels of intestinal lactobacilli (Gilliland et al. 1984). Also, a mid-range bile tolerant culture was chosen, *L. reuteri* WB-75 (WB-75) along with two other cultures that were similar in bile tolerance to L-23, *L. reuteri* WB-74 (WB-74) and DS-37 (DS-37).

<u>FEEDING STUDIES:</u>

<u>Growth & Performance:</u>

While L-23 was shown in a previous study to significantly improve growth and performance in swine (Lee et al. 2001), it did not cause similar results in the present study. This may have resulted from the variations in dietary components. More likely the difference was due to how the culture had been grown. In the study reported by Lee et al. (2001) the culture was grown in broth containing starch as the sole carbohydrate to insure active amylase in the cells. For the present study the growth medium contained glucose as the only carbohydrate. Thus, a sufficient level of amylase may have been lacking.

Pigs fed cultures L-23 and DS-33 did better than the control especially in experiment 1 of study 1(P=0.067). These cultures caused a more efficient F:G than any of the cultures of lactobacilli and the control for study 1. Even though differences were marginal, cultures DS-33 or L-23 might be considered for future larger scale feeding trials. In study 2, pigs fed the culture DS-36 exhibited a trend toward higher ADG and ADFI than did those in the control group. While the differences were not significant nor was there an indication of improved F:G, DS-36 might merit further consideration based on this information. When data on performance is considered for both studies there is no clean cut information to support the use of any of the cultures to improve performance of the pigs. Perhaps future research focused on growth and performance of nursery pigs should further evaluate DS-33, L-23, or DS-36. This should involve more pigs and imposition of less handling of the pigs for feeding and/or drawing blood. In the future studies the pigs should be handled in a setting similar to that used in the commercial industry.

Microbial Counts:

No conclusive results can be drawn from either study in reducing coliforms or *Campylobacter* in swine. The most prevalent species of *Campylobacter* in swine is *C. coli* (Jacobs-Reitsma 2000). These results coincide with both studies in the present study in that the only species of *Campylobacter* identified was *C. coli*. *Salmonella* was detected in only two pigs and they were in study 2. It is thought that prevalence of *Salmonella* is herd related (Done 2001). *Escherichia coli* O157:H7 was tested in study 2 experiment 2 with no confirmed positives reported. The bacterium, *E. coli*, is one of the major cause of illness in nursery pigs with *E. coli* K88 being the most virulent (Done 2001). There have been no reported cases of *E. coli* O157:H7 in commercial pigs in the United States. It is believed that swine do not harbor this pathogen because of the management practices and little contact with the pathogen (Cornick and Helgerson 2004), but they are capable of harboring it (Cornick and VuKhac 2008).

Serum Blood Chemistry:

The normal range for total serum protein in pigs is 4.40-8.28 g/dL (Lindemann et al. 1993, Mersmann and Pond 2001, Odink et al. 1990, Tumbleson and Kalish 1972). Plasma is approximately 5-7% protein. Total protein in blood serum includes albumin and globulin (Kaneko 1989b). In study 1 pigs fed L-23 and WB-74 exhibited a significantly higher total protein level than the control group. For study 2 there was no overall treatment effect. Several factors could have increased total protein, such as albumin or globulin levels (Mersmann and Pond 2001). Thus *L. acidophilus* L-23 or *L. reuteri* WB-74 appears to be the best choice for increasing total serum protein.

Catalyzing L-aspartate and 2-oxoglutarate to oxaloacetate and glutamate is one of the functions of AST. An elevated level of this enzyme in the serum is a good indicator of soft tissue damage, but the location of the damage not known because the enzyme is not organ-specific (Kramer 1989). Elevation of the blood enzyme has been associated with white muscle disease in pigs (Cardinet 1989). For AST, there was an overall treatment effect where the level for the group fed DS-33 was significantly lower than that of the control. There was also a significant week 1 effect where DS-33 was lower than the control. To effectively reduce levels of AST in pigs, *L. reuteri* DS-33 is a clear choice among the cultures tested.

Serum Immunoglobulins:

The normal range for levels of serum IgA in pigs are 0.369 to 0.609 mg/mL (Swamy et al. 2008, White et al. 2002). In study 1 weekly IgA values increased more, although not significantly, in the group fed culture WB-74 than in the control animals. During the first week the values for cultures WB-75 and L-23 also increased more than the control. In study 2 none of the culture groups caused consequently greater increases compared to the control group. Based on these observations, WB-74 appears to be the culture of choice.

Reported ranges for serum IgG are 4.980 to 7.904 (Swamy et al. 2008, White et al. 2002). Pigs in study 1 were outside of this range. Culture L-23 exhibited the largest increase in change for study 1 of all groups. None of the cultures in study 2 had higher increases when compared to the control group. It is recommended that culture L-23 be used to increase IgG in nursery pigs.

The IgM levels for both studies were within the reported normal serum values (Swamy et al. 2008, White et al. 2002). The only culture in study 1 that had a higher increase than the control group was culture WB-74. The same trend was noticed in study 2 with culture WB-72 exhibiting higher changes than the control group. This culture had a large increase of serum IgM. Thus, to increase serum IgM levels in the nursery pig culture *L. reuteri* WB-72 could be administered.

Lipopolysaccharide (LPS) Challenge:

The *Escherichia coli* O111:B4 lipopolysaccharide (LPS) was used to study the immune response of the pigs ingesting lactobacilli. This LPS has been shown to cause an immune response in nursery pigs (Mandali et al. 2000, Mandali et al. 2002, Smith 2006). Lipopolysaccharide, a cell wall component, affects the animal immunologically as live bacteria would (Mandali et al. 2002).

Rectal Temperatures:

The temperatures of the pigs for both studies peaked at hour 3.0 with no significant differences observed. This is an indication that an immune response occurred (Van Gucht et al. 2004). Similar results were reported by Smith (2006). In study 2, pigs fed DS-37, although not significant, had a lower temperature than the control group. This could be an indication of reduced response by the pigs to the LPS.

Serum Blood Chemistry:

Blood is involved in many functions of the body. Blood has the capability to regulate body temperature by distributing heat. It helps remove metabolic wastes by transporting them to the liver, kidneys, lungs, or intestines. A defense system of white blood cells and antibodies is another function. It is involved in respiration and nutrient transportation. Blood regulates metabolism through hormone transportation. Acid-base balance of the body is also maintained in the blood (Rand and Murray 2000).

Total protein consists mainly of globulin and albumin. Serum total protein levels may be decreased as result of catabolism, which is a result of a fever, inflammation, or chronic disease. Total protein may also be altered by serum IgG since it is composed of 15-25% of IgG. Globulin and albumin levels are similar in the pig, but this is not true for all mammalian species. Albumin levels run parallel with total protein levels (Mersmann and Pond 2001). Globulin is found in three fractions, α, β, and γ, with various bodily responsibilities (Kaneko 1989b). With that no differences were found for globulin levels in study 1. Culture DS-36 in study 2 had a significantly lower globulin level than the control and DS-37 groups. A possible explanation for the lower globulin level may be that culture DS-33 exhibited the lowest IgG level. Serum IgG is one of the most abundant globulins found in the γ fraction (Swenson 1984).

Albumin:Globulin ratio will increase in dehydration because of an increase in albumin levels or as a result of a decrease in globulins. Albumin may also increase due to it binding to serum constituents to be filtered by the kidneys. However, a decrease in albumin:globulin ratio could be a sign of liver problems (Kaneko 1989b). In study 1 no differences were observed. In study 2 the ratios were higher than the control group at hour 3.0 for cultures DS-36 and WB-76. These cultures numerically had the highest albumin levels for that hour as well. Cultures *L. reuteri* DS-36 or WB-76 may be helpful in reducing blood constituents during an immune response or cause dehydration.

Total bilirubin (bili) is a measurement of the end product of red blood cell turnover. It is produced by specialized macrophages in the liver. It is conjugated in the liver and secreted into the bile. It is converted several different times and is finally secreted out the feces which give it its brown color. One of the end products is absorbed into the kidneys thus giving urine its yellow color (Yen 2001). In study 1, control group bili levels were numerically higher than pigs fed cultures DS-33, WB-75, and L-23. In study 2 pigs fed DS-37 had a significantly lower level than the control. It is thought that the lipopolysaccharide caused an inflammatory response in the pigs. This response triggered the release of cytokines. The cytokine, tumor necrosis factor (TNF), promoted anemia in the body by shortening red blood cells' life span and decreasing production (Stockham 2000). Since total bili is related to erythrocyte turnover, it is possible that the control group may have a higher TNF than pigs fed DS-37. Thus, the control group red blood cells life spans were reduced, having a higher turnover, and subsequent higher total bili. When liver injury was induced, a reduction in total bilirubin has been reported in rats rectally supplemented with *L. plantarum* (Adawi et al. 1997). The culture DS-37 has the possibility to reduce turnover of red blood cells in nursery pigs during an immune response.

Serum triglyceride levels are increased during fasting (Mersmann and Pond 2001). This held true for both studies. The triglyceride levels drastically increased from hour 0 to hour 12 following the challenge with LPS. The pigs were fed after the hour 12 measurement and by hour 24 triglyceride levels dropped. Study 1 did not have any noticeable differences in serum triglyceride levels. However, during study 2, the control had a significantly higher level than did the group fed DS-37. It has been demonstrated that as hours of feed deprivation are increased so are triglyceride levels (Webel et al. 1997). Keeping triglyceride levels low during a LPS challenge or feed deprivation in swine is possible by feeding the culture *L. reuteri* DS-37.

The proteins VLDL, HDL, and LDL are considered to be α-globulins. Stress from temperature can cause VLDL and LDL to increase in the serum (Kaneko 1989a). Very low-density lipoprotein (VLDL) is composed of 60% serum triglycerides (Mersmann and Pond 2001). Study 1 did not have any observed differences for VLDL. Study 2 pigs fed DS-37 had a significantly lower serum VLDL than the control pigs. The reason could be the higher percentage of triglycerides found in VLDL. Since the triglycerides increased, a trickle effect occurred where the VLDL also increased. Another explanation is that LPS was bound by VLDL, HDL, and low-density lipoprotein (LDL) and secreted out of the system through the liver cells, hepatocytes (Tuin 2006). Therefore, culture DS-37 will decrease VLDL during an intestinal Gram-negative challenge.

Serum Immunoglobulins:

Immunoglobulins are a portion of γ-globulins and considered plasma proteins (Swenson 1984). These proteins are secreted by plasma cells, B cells, unlike other globulins, which are synthesized in the liver (Rand and Murray 2000). They are able to function as membrane-bound and soluble proteins (Modiano 2000). There are five classifications of immunoglobulins (Ig), IgA, IgD, IgE, IgG, and IgM. Immunoglobulin G (IgG) is the most abundant of the immunoglobulins. It is found in the blood and tissue (Swenson 1984). It can bind to inflammatory cells that have special surface receptors (Modiano 2000). Immunoglobulin G opsonizes bacteria which makes it easier for phagocytosis. It is also the main antibody for the secondary response that neutralizes viruses and bacterial toxins (Rand and Murray 2000). The glycoprotein IgA is found in external excretions, such as colostrum, saliva, and tears. It is involved in infections of microorganisms in the gastrointestinal tract and mouth (Swenson 1984). This immunoglobulin provides an important barrier at mucosal epithelial cells, which are involved in pathogenic bacteria (Porter 1973). The initial antibody produced, IgM, attacks foreign red blood cells (Modiano 2000, Swenson 1984).

Serum IgA levels for pigs fed culture L-23 was the only group in study 1 that exhibited an increase, but it was only slight. Study two culture DS-36 caused a trend toward higher increased changes than the control pigs at hour

1.5, 3.0, and 6.0. Therefore, a choice to increase IgA levels during a LPS response might be culture DS-36.

Serum IgG levels for pigs fed DS-33 in study 1 increased more than in the control group at hours 3.0 and 6.0. In study 2, at hours 1.5 and 12, culture DS-36 had higher increases than the control pigs. A choice to increase IgG levels during a Gram-negative challenge are the cultures *L. reuteri* DS-33 and DS-36.

At hour 3.0 in study 1, culture L-23 exhibited the largest increased change serum IgM. Culture WB-76 in study 2 had a higher increased change than the control for hours 1.5 and 12. Thus, cultures L-23 and WB-76 have the potential to increase serum IgM during an LPS challenge.

It should also be mentioned that in study 2 there was an age difference in pigs in the two experiments. Pigs in experiment 2 were 11 days younger than those in experiment1. Some of the variability observed for this study could be related for this age difference.

Since the LPS was injected into the gut, studying the effects of intestinal immunoglobulins is future work to be completed. It will be interesting to observe the differences of blood serum and intestinal immunoglobulins for the different cultures of lactobacilli. Fecal immunoglobulins will be completed for this trial before submitting a manuscript for publication. It has already been stated that IgA is secreted into the intestines. Therefore, it will be interesting to observe the fecal IgA levels for the studies.

As well as testing serum immunoglobulins, cytokines are another indicator of an immune response. Webel et al. (1997) reported after 2 hours of an intraperitoneal injection of 5 µL/kg of body weight of LPS *E. coli* K-235, plasma tumor necrosis factor- α (TNF-α) was elevated 10-fold. Interleukin-6 (IL-6) was elevated 200-fold by hour 4 of the challenge. These cytokines are made by stimulated macrophages (Van Heugten et al. 1994). The cytokines TNF-α and IL-6 will be tested on blood serum before manuscript submission.

Suggested future research would be to evaluate the influence of different cultures of lactobacilli on complete blood cell counts. The blood cells should respond to a bacterial infection. Erythrocytes and platelets will change during most bacterial infections. Mast cells contribute a role in unique inflammatory responses. Basophils and eosinophils have an essential role in tissue inflammation (Stockham 2000). Thus, it would be interesting to study these effects on pigs fed the cultures of lactobacilli during a similar LPS challenge.

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APPENDIX A

SWINE CUTLURES

Table A1. Identification of isolates from domestic pigs of *Lactobacillus reuteri* by phenotypic characterization[a]

Carbohydrate	Bergey's[b]	DS-29[c]	DS-31[c]	DS-33[c]	DS-35[c]	DS-36[c]	DS-37[c]	DS-38[c]	DS-39[c]
D-Arabinose	+	-	-	-	-	-	-	-	-
Ribose	+	+	+	+	+	+	+	+	+
D-Xylose	-	-	-	+	+	+	+	+	+
Galactose	+	+	+	+	+	+	+	+	+
D-Glucose	+	+	+	+	+	+	+	+	+
D-Fructose	+	-	-	-	-	-	-	-	-
D-Mannose	-	-	-	-	-	-	-	-	-
Rhamnose	-	-	-	-	-	-	-	-	-
Mannitol	-	-	-	-	-	-	-	+	-
Sorbitol	o[d]	-	-	-	-	-	-	-	-
Amygdaline	o[d]	-	-	-	-	-	-	-	-
Esculine	-	-	-	-	-	-	-	-	-
Salicine	-	-	-	-	-	-	+	-	-
Cellobiose	-	-	-	-	-	-	+	-	-
Maltose	+	+	+	+	+	+	+	+	-
Lactose	+	+	+	+	+	+	+	+	-
Melibiose	+	+	+	+	+	+	+	+	+
Saccharose	+	-	-	+	+	+	-	+	+
Trehalose	-	-	-	-	-	-	+	-	-
Melezitose	-	-	-	-	-	-	-	-	-
D-Raffinose	+	+	+	+	+	+	+	+	+
Gluconate	+	-	-	-	-	-	-	-	-
Growth at 15℃	-	-	-	-	-	-	-	-	-
Growth at 45℃	+	+	+	+	+	+	+	+	+
NH_4^+ from Arg.	+	+	+	+	+	+	+	+	+

[a]Based on the API 50 CH system (bioMérieux, France)

[b]The carbohydrate reactions are from the 9th Edition of Bergery's Manual of Determinative Bacteriology

[c]All were Gram positive, catalase negative rods

[d]o = reaction not determined

Table A2. Identification of isolates from wild boar intestines of *Lactobacillus reuteri* by phenotypic characterization

Carbohydrate	Bergey's[b]	WB-72[c]	WB-74[c]	WB-75[c]	WB-76[c]	WB-78[c]
D-Arabinose	+	-	-	-	-	-
Ribose	+	+	+	+	+	+
D-Xylose	-	+	+	+	+	+
Galactose	+	+	+	+	+	+
D-Glucose	+	+	+	+	+	+
D-Fructose	+	+	-	+	+	+
D-Mannose	-	-	-	-	-	-
Rhamnose	-	-	-	-	-	-
Mannitol	-	-	-	-	-	-
Sorbitol	o[d]	-	-	-	-	-
Amygdaline	o[d]	+	-	-	-	-
Esculine	-	+	+	+	+	+
Salicine	-	+	+	-	+	-
Cellobiose	-	-	-	-	-	-
Maltose	+	+	+	+	+	+
Lactose	+	+	+	+	+	+
Melibiose	+	+	+	+	+	+
Saccharose	+	+	+	+	+	+
Trehalose	-	-	-	-	-	-
Melezitose	-	-	-	-	-	-
D-Raffinose	+	+	+	+	+	+
Gluconate	+	+	+	-	-	+
Growth at 15℃	-	-	-	-	-	-
Growth at 45℃	+	+	+	+	+	+
NH_4^+ from Arg.	+	+	+	+	+	+

[a]Based on the API 50 CH system (bioMérieux, France)

[b]The carbohydrate reactions are from the 9th Edition of Bergery's Manual of Determinative Bacteriology

[c]All were catalase negative, Gram positive rods

[d]o = reaction not determined

Table A3. Identification of *Lactobacillus acidophilus* L-23 by phenotypic characterization[a]

Carbohydrate	Bergey's[b]	*L. acidophilus* L-23[c]
D-Arabinose	-	-
Ribose	-	+
D-Xylose	-	+
Galactose	+	+
D-Glucose	+	+
D-Fructose	+	+
D-Mannose	+	+
Rhamnose	-	-
Mannitol	-	+
Sorbitol	-	-
Amygdaline	+	+
Esculine	+	+
Salicine	+	+
Cellobiose	+	+
Maltose	+	+
Lactose	+	+
Melibiose	+/-	+
Saccharose	+	+
Trehalose	+/-	+
Melezitose	-	-
D-Raffinose	+/-	+
Amidon	+	+
Gluconate	-	-
Growth at 15℃	-	-
Growth at 45℃	+	+
NH_4^+ from Arg.	-	-

[a]Based on the API 50 CH system (bioMérieux, France)

[b]The carbohydrate reactions are from the 9th Edition of Bergery's Manual of Determinative Bacteriology

[c]*L. acidophilus* L-23 is a catalase negative, Gram positive rod

Table A4. Bile tolerance of cultures of lactobacilli[a]

Isolate	Rep	Hour 1[b]	Hour 2[b]	Hour 3[b]	Hour 4[b]	Hour 5[b]	Hour 6[b]	Hour 7[b]
L. reuteri DS-29	1	0.040	0.105	0.299	0.575	0.785	1.166	1.341
	2	0.034	0.085	0.239	0.512	0.682	0.959	1.154
	Mean	0.037	0.095	0.269	0.544	0.734	1.063	1.248
L. reuteri DS-31	1	0.043	0.111	0.278	0.550	0.694	1.044	1.154
	2	0.039	0.076	0.227	0.516	0.718	1.024	1.234
	Mean	0.041	0.094	0.253	0.533	0.706	1.034	1.194
L. reuteri DS-33	1	0.046	0.136	0.343	0.598	0.983	1.153	1.203
	2	0.032	0.092	0.257	0.516	0.818	0.824	1.210
	Mean	0.039	0.114	0.300	0.557	0.901	0.989	1.207
L. reuteri DS-35	1	0.040	0.103	0.274	0.536	0.693	1.006	1.231
	2	0.036	0.088	0.246	0.500	0.648	0.928	1.168
	Mean	0.038	0.096	0.260	0.518	0.671	0.967	1.200
L. reuteri DS-36	1	0.057	0.135	0.342	0.653	0.765	0.937	1.180
	2	0.036	0.100	0.287	0.542	0.689	0.776	1.180
	Mean	0.047	0.118	0.315	0.598	0.727	0.857	1.180
L. reuteri DS-37	1	0.039	0.980	0.231	0.463	0.722	0.854	0.971
	2	0.048	0.098	0.228	0.426	0.623	0.720	1.019
	Mean	0.044	0.539	0.230	0.445	0.673	0.787	0.995
L. reuteri DS-38	1	0.035	0.139	0.315	0.542	0.861	0.945	1.030
	2	0.039	0.106	0.276	0.478	0.660	0.662	1.048
	Mean	0.037	0.123	0.296	0.510	0.761	0.804	1.039
L. reuteri DS-39	1	0.052	0.146	0.326	0.576	0.672	0.937	0.824
	2	0.047	0.106	0.266	0.481	0.753	0.956	0.921
	Mean	0.050	0.126	0.296	0.529	0.713	0.947	0.873
L. reuteri WB-72	1	0.036	0.114	0.304	0.702	0.971	1.416	1.446
	2	0.025	0.078	0.215	0.436	0.659	0.767	0.821
	Mean	0.031	0.096	0.260	0.569	0.815	1.092	1.134
L. reuteri WB-74	1	0.041	0.100	0.250	0.577	0.811	1.431	1.301
	2	0.022	0.061	0.190	0.397	0.601	0.703	0.771
	Mean	0.032	0.081	0.220	0.487	0.706	1.067	1.036
L. reuteri WB-75	1	0.036	0.100	0.267	0.650	0.846	1.384	1.414
	2	0.022	0.060	0.180	0.388	0.601	0.699	0.769
	Mean	0.029	0.080	0.224	0.519	0.724	1.042	1.092
L. reuteri WB-76	1	0.034	0.100	0.288	0.685	0.863	1.217	1.507
	2	0.022	0.068	0.200	0.427	0.619	0.701	0.767
	Mean	0.028	0.084	0.244	0.556	0.741	0.959	1.137
L. reuteri WB-78	1	0.037	0.101	0.269	0.643	1.046	1.401	1.221
	2	0.019	0.054	0.171	0.366	0.570	0.682	0.742
	Mean	0.028	0.078	0.220	0.505	0.808	1.042	0.982
L. acidophilus L-23	1	0.036	0.076	0.153	0.354	0.548	0.678	0.732
	2	0.036	0.060	0.126	0.263	0.476	0.658	0.738
	Mean	0.036	0.068	0.140	0.309	0.512	0.668	0.735

[a]In deMan, Rogasa, Sharpe (MRS) broth + 0.3% oxgall

[b]Values are increases in A_{620nm} at 37℃.

Table A5. Comparisons of bile tolerance of cultures of lactobacilli[a]

Isolate	Rep 1[b]	Rep 2[b]	Mean
L. reuteri DS-29	0.575	0.512	0.544
L. reuteri DS-31	0.550	0.516	0.533
L. reuteri DS-33	0.598	0.516	0.557
L. reuteri DS-35	0.536	0.500	0.518
L. reuteri DS-36	0.653	0.542	0.598
L. reuteri DS-37	0.463	0.397	0.430
L. reuteri DS-38	0.542	0.478	0.510
L. reuteri DS-39	0.576	0.481	0.529
L. reuteri WB-72	0.702	0.436	0.569
L. reuteri WB-74	0.577	0.397	0.487
L. reuteri WB-75	0.650	0.388	0.519
L. reuteri WB-76	0.685	0.427	0.556
L. reuteri WB-78	0.643	0.366	0.505
L. acidophilus L-23	0.354	0.263	0.309

[a]In deMan, Rogasa, Sharpe (MRS) broth + 0.3% oxgall

[b]Values are increases in A_{620nm} after hour 4 at 37℃.

APPENDIX B

STUDY 1 RAW DATA

Table B1. Study 1 treatment counts of lactobacilli[a] (Log_{10} cfu/mL)

Treatment[b]	Exp.	Day 0	Day 3 or 4
Control	1	1.72	3.08
	2	2.38	2.86
L. reuteri DS-33	1	7.91	8.00
	2	8.06	8.06
L. reuteri WB-74	1	8.00	7.53
	2	7.98	6.76
L. reuteri WB-75	1	7.23	6.60
	2	7.30	6.62
L. acidophilus L-23	1	7.76	7.71
	2	7.96	7.90

[a]Plated on deMan, Rogasa, Sharpe agar (MRSA)

[b]Ideal count for treatments was 8.00 log_{10} cfu/mL

Table B2. Swine assignments for study 1 feeding lactobacilli cultures

Study	Treatment[a]	Exp. 1 Pig[b]	Crate Number	Exp. 2 Pig[c]	Crate Number
1	Control	10-4	3	33-12	1
		5-1	8	30-9	3
		2-5	13	41-7	14
	L. reuteri DS-33	9-3	2	41-5	2
		2-1	9	33-11	8
		7-3	12	38-8	15
	L. reuteri WB-74	2-3	1	41-6	4
		7-4	10	31-6	5
		10-13	14	33-13	11
	L. reuteri WB-75	12-4	4	33-8	10
		9-2	7	41-3	6
		5-4	11	36-4	9
	L. acidophilus L-23	7-6	16	33-7	16
		12-1	6	41-2	7
		4-1	15	30-10	12

[a]All treatments were fed 10 mL twice a day; Lactobacilli concentrations fed were 1 x 10^9 cfu/mL

[b]Experiment 1 were all barrows (n=15)

[c]Experiment 2 were all gilts (n=15)

Table B3 . Study 1 weekly swine weights (kg)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	12.43	16.60	19.87	24.58
		8	9.98	13.15	18.14	20.68
		13	11.25	16.33	16.87	20.23
	Exp. 1 Mean		11.22	15.36	18.29	21.83
	2[c]	1	11.52	15.15	18.60	24.63
		3	10.07	13.15	16.51	21.50
		14	9.03	11.52	14.42	19.28
	Exp. 2 Mean		10.21	13.28	16.51	21.80
	Overall Mean		10.78	14.47	17.53	21.82
L. reuteri DS-33	1[b]	2	12.34	16.51	22.50	26.67
		9	10.89	13.43	18.05	21.41
		12	10.80	14.97	20.96	26.49
	Exp. 1 Mean		11.34	14.97	20.50	24.86
	2[c]	2	11.70	15.51	19.05	24.40
		8	10.30	14.51	17.87	22.41
		15	8.44	10.98	14.24	18.73
	Exp. 2 Mean		10.15	13.67	17.06	21.85
	Overall Mean		10.83	14.41	19.02	23.57
L. reuteri WB-74	1[b]	1	12.79	17.24	21.68	24.68
		10	10.80	15.06	20.32	25.04
		14	10.34	12.25	15.69	18.51
	Exp. 1 Mean		11.31	14.85	19.23	22.74
	2[c]	4	11.43	14.61	17.06	22.00
		5	10.07	13.52	16.83	20.87
		11	8.71	12.25	15.69	21.05
	Exp. 2 Mean		10.07	13.46	16.53	21.30
	Overall Mean		10.78	14.25	18.07	22.12
L. reuteri WB-75	1[b]	4	11.61	15.79	20.41	24.58
		7	11.34	14.97	19.32	22.23
		11	10.07	14.51	19.32	22.86
	Exp. 1 Mean		11.01	15.09	19.69	23.22
	2[c]	6	10.43	12.52	15.42	19.64
		9	9.80	13.34	16.01	20.68
		10	11.34	15.06	17.60	22.14
	Exp. 2 Mean		10.52	13.64	16.34	20.82
	Overall Mean		10.80	14.47	18.25	22.19
L. acidophilus L-23	1[b]	5	13.15	16.96	23.22	27.31
		6	11.79	14.70	18.87	22.95
		15	10.70	14.15	18.05	21.32
	Exp. 1 Mean		11.88	15.27	20.05	23.86
	2[c]	7	10.80	13.43	16.96	21.86
		12	7.89	11.34	14.88	19.14
		13	12.25	16.15	18.87	25.04
	Exp. 2 Mean		10.31	13.64	16.90	22.01
	Overall Mean		11.21	14.57	18.70	23.07

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B4. Study 1 weekly ADG[a] (kg)

Treatment[b]	Exp.[b]	Pig[b]	Week 1	Week 2	Week 3
Control	1[c]	3	0.60	0.47	0.79
		8	0.45	0.71	0.42
		13	0.73	0.08	0.56
	Exp. 1 Mean		0.59	0.42	0.59
	2[d]	1	0.52	0.49	0.75
		3	0.44	0.48	0.62
		14	0.36	0.41	0.61
	Exp. 2 Mean		0.44	0.46	0.66
	Overall Mean		0.52	0.44	0.63
L. reuteri DS-33	1[c]	2	0.60	0.86	0.70
		9	0.36	0.66	0.56
		12	0.60	0.86	0.92
	Exp. 1 Mean		0.52	0.79	0.73
	2[d]	2	0.54	0.51	0.67
		8	0.60	0.48	0.57
		15	0.36	0.47	0.56
	Exp. 2 Mean		0.50	0.48	0.60
	Overall Mean		0.51	0.64	0.66
L. reuteri WB-74	1[c]	1	0.64	0.64	0.50
		10	0.61	0.75	0.79
		14	0.27	0.49	0.47
	Exp. 1 Mean		0.51	0.63	0.58
	2[d]	4	0.45	0.35	0.62
		5	0.49	0.47	0.50
		11	0.51	0.49	0.67
	Exp. 2 Mean		0.48	0.44	0.60
	Overall Mean		0.49	0.53	0.59
L. reuteri WB-75	1[c]	4	0.60	0.66	0.70
		7	0.52	0.62	0.48
		11	0.64	0.69	0.59
	Exp. 1 Mean		0.58	0.66	0.59
	2[d]	6	0.30	0.41	0.53
		9	0.51	0.38	0.58
		10	0.53	0.36	0.57
	Exp. 2 Mean		0.44	0.39	0.56
	Overall Mean		0.51	0.52	0.57
L. acidophilus L-23	1[c]	5	0.54	0.89	0.68
		6	0.41	0.60	0.68
		15	0.49	0.56	0.54
	Exp. 1 Mean		0.48	0.68	0.64
	2[d]	7	0.38	0.51	0.61
		12	0.49	0.51	0.53
		13	0.56	0.39	0.77
	Exp. 2 Mean		0.48	0.47	0.64
	Overall Mean		0.48	0.57	0.64

[a]ADG - average daily gain

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B5. Study 1 weekly ADFI[a] (kg)

Treatment[b]	Exp.[b]	Pig[b]	Week 1	Week 2	Week 3
Control	1[c]	3	0.69	0.96	1.54
		8	0.58	1.00	1.03
		13	0.76	0.84	0.98
	Exp. 1 Mean		0.68	0.93	1.18
	2[d]	1	0.75	0.98	1.23
		3	0.68	0.88	1.01
		14	0.54	0.74	1.11
	Exp. 2 Mean		0.66	0.87	1.12
	Overall Mean		0.67	0.90	1.15
L. reuteri DS-33	1[c]	2	0.86	1.10	1.45
		9	0.50	0.85	1.16
		12	0.95	1.21	1.69
	Exp. 1 Mean		0.77	1.05	1.43
	2[d]	2	0.86	0.94	1.19
		8	0.85	0.95	1.08
		15	0.62	0.84	1.06
	Exp. 2 Mean		0.78	0.91	1.11
	Overall Mean		0.77	0.98	1.27
L. reuteri WB-74	1[c]	1	0.95	1.03	1.34
		10	0.83	1.02	1.59
		14	0.51	0.85	1.08
	Exp. 1 Mean		0.76	0.97	1.34
	2[d]	4	0.74	0.92	1.10
		5	0.82	0.89	1.04
		11	0.75	0.92	1.19
	Exp. 2 Mean		0.77	0.91	1.11
	Overall Mean		0.77	0.94	1.22
L. reuteri WB-75	1[c]	4	0.80	1.02	1.23
		7	0.74	1.00	1.10
		11	0.65	1.09	1.48
	Exp. 1 Mean		0.73	1.04	1.27
	2[d]	6	0.62	0.85	0.96
		9	0.78	0.80	1.05
		10	0.84	0.83	1.16
	Exp. 2 Mean		0.75	0.83	1.06
	Overall Mean		0.74	0.93	1.16
L. acidophilus L-23	1[c]	5	0.80	1.24	1.47
		6	0.63	0.91	1.13
		15	0.78	0.99	0.87
	Exp. 1 Mean		0.74	1.04	1.16
	2[d]	7	0.67	0.94	1.16
		12	0.70	0.92	1.06
		13	0.79	0.93	1.24
	Exp. 2 Mean		0.72	0.93	1.15
	Overall Mean		0.73	0.99	1.16

[a]ADFI - average daily feed intake

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B6. Study 1 weekly F:G ratio[a]

Treatment[b]	Exp.[b]	Pig[b]	Week 1	Week 2	Week 3
Control	1[c]	3	1.16	2.05	1.96
		8	1.29	1.40	2.43
		13	1.04	10.75	1.75
	Exp. 1 Mean		1.16	4.73	2.05
	2[d]	1	1.45	1.99	1.63
		3	1.54	1.83	1.62
		14	1.53	1.78	1.83
	Exp. 2 Mean		1.51	1.87	1.69
	Overall Mean		1.34	3.30	1.87
L. reuteri DS-33	1[c]	2	1.44	1.29	2.08
		9	1.38	1.29	2.07
		12	1.59	1.41	1.83
	Exp. 1 Mean		1.47	1.33	1.99
	2[d]	2	1.58	1.86	1.78
		8	1.42	1.97	1.91
		15	1.71	1.80	1.89
	Exp. 2 Mean		1.57	1.88	1.86
	Overall Mean		1.52	1.60	1.93
L. reuteri WB-74	1[c]	1	1.50	1.62	2.68
		10	1.37	1.36	2.02
		14	1.86	1.72	2.30
	Exp. 1 Mean		1.58	1.57	2.33
	2[d]	4	1.63	2.62	1.79
		5	1.66	1.87	2.06
		11	1.49	1.86	1.78
	Exp. 2 Mean		1.59	2.12	1.88
	Overall Mean		1.59	1.84	2.11
L. reuteri WB-75	1[c]	4	1.34	1.55	1.77
		7	1.42	1.61	2.28
		11	1.03	1.59	2.51
	Exp. 1 Mean		1.26	1.58	2.19
	2[d]	6	2.08	2.05	1.83
		9	1.54	2.10	1.80
		10	1.58	2.28	2.04
	Exp. 2 Mean		1.73	2.14	1.89
	Overall Mean		1.50	1.86	2.04
L. acidophilus L-23	1[c]	5	1.48	1.38	2.16
		6	1.51	1.53	1.65
		15	1.58	1.77	1.60
	Exp. 1 Mean		1.52	1.56	1.80
	2[d]	7	1.79	1.85	1.90
		12	1.42	1.83	1.99
		13	1.41	2.40	1.61
	Exp. 2 Mean		1.54	2.03	1.83
	Overall Mean		1.53	1.79	1.82

[a]F:G - feed to gain

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B7. Study 1 overall growth and performance (kg)

Treatment[a]	Exp.[a]	Pig[a]	ADG[b]	ADFI[c]	F:G[d]
Control	1[e]	3	0.62	1.06	1.64
		8	0.53	0.87	1.57
		13	0.45	0.86	1.84
	Exp. 1 Mean		0.53	0.93	1.68
	2[f]	1	0.59	0.99	1.68
		3	0.51	0.86	1.66
		14	0.46	0.80	1.74
	Exp. 2 Mean		0.52	0.88	1.69
	Overall Mean		0.53	0.91	1.69
L. reuteri DS-33	1[e]	2	0.72	1.14	1.51
		9	0.53	0.84	1.51
		12	0.79	1.28	1.55
	Exp. 1 Mean		0.68	1.08	1.52
	2[f]	2	0.57	1.00	1.74
		8	0.55	0.96	1.76
		15	0.46	0.84	1.82
	Exp. 2 Mean		0.53	0.93	1.77
	Overall Mean		0.60	1.01	1.65
L. reuteri WB-74	1[e]	1	0.59	1.11	1.84
		10	0.72	1.15	1.53
		14	0.41	0.81	1.89
	Exp. 1 Mean		0.57	1.02	1.75
	2[f]	4	0.47	0.92	1.93
		5	0.49	0.91	1.88
		11	0.56	0.95	1.72
	Exp. 2 Mean		0.51	0.93	1.84
	Overall Mean		0.54	0.98	1.80
L. reuteri WB-75	1[e]	4	0.65	1.02	1.50
		7	0.54	0.95	1.68
		11	0.64	1.08	1.59
	Exp. 1 Mean		0.61	1.01	1.59
	2[f]	6	0.41	0.81	1.96
		9	0.49	0.88	1.79
		10	0.49	0.94	1.94
	Exp. 2 Mean		0.46	0.88	1.90
	Overall Mean		0.54	0.95	1.74
L. acidophilus L-23	1[e]	5	0.71	1.17	1.58
		6	0.56	0.89	1.52
		15	0.53	0.88	1.62
	Exp. 1 Mean		0.60	0.98	1.57
	2[f]	7	0.50	0.92	1.86
		12	0.51	0.89	1.76
		13	0.57	0.99	1.72
	Exp. 2 Mean		0.53	0.93	1.78
	Overall Mean		0.56	0.96	1.68

[a]Description of treatments, experiments, and pigs - see Table B2

[b]ADG - average daily gain

[c]ADFI - average daily feed intake

[d]F:G - feed to gain ratio

[e]Experiment 1 were barrows

[f]Experiment 2 were gilts

Table B8. Study 1 weekly fecal counts of coliforms[a] (Log_{10} cfu/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	5.80	7.18	6.43	8.59
		8	8.54	6.74	7.34	6.40
		13	5.86	6.56	7.11	5.76
	Exp. 1 Mean		6.74	6.82	6.96	6.91
	2[d]	1	8.18	6.85	5.54	6.75
		3	7.30	6.32	5.87	5.86
		14	7.65	7.51	6.76	5.20
	Exp. 2 Mean		7.71	6.89	6.06	5.94
	Overall Mean		7.22	6.86	6.51	6.43
L. reuteri DS-33	1[c]	2	6.78	5.91	5.86	7.11
		9	7.26	5.83	7.70	6.15
		12	5.73	5.94	5.76	4.08
	Exp. 1 Mean		6.59	5.89	6.44	5.78
	2[d]	2	6.69	5.83	6.36	6.20
		8	8.90	7.53	7.32	6.57
		15	6.40	7.26	8.30	6.52
	Exp. 2 Mean		7.33	6.87	7.33	6.43
	Overall Mean		6.96	6.38	6.88	6.11
L. reuteri WB-74	1[c]	1	5.04	7.73	7.72	5.41
		10	6.04	7.36	7.74	6.04
		14	4.88	4.73	5.45	6.04
	Exp. 1 Mean		5.32	6.61	6.97	5.83
	2[d]	4	6.43	5.92	7.89	6.78
		5	7.52	8.00	7.73	7.86
		11	8.20	7.69	7.26	5.94
	Exp. 2 Mean		7.38	7.20	7.62	6.86
	Overall Mean		6.35	6.91	7.30	6.35
L. reuteri WB-75	1[c]	4	6.28	6.74	7.94	7.08
		7	5.98	6.30	5.91	6.11
		11	7.15	7.26	6.90	7.11
	Exp. 1 Mean		6.47	6.77	6.92	6.77
	2[d]	6	7.46	6.76	5.65	4.69
		9	6.30	6.23	6.88	5.97
		10	7.08	4.93	8.08	5.15
	Exp. 2 Mean		6.95	5.97	6.87	5.27
	Overall Mean		6.71	6.37	6.89	6.02
L. acidophilus L-23	1[c]	5	5.96	5.81	6.62	7.64
		6	8.08	5.61	6.26	5.94
		15	7.34	5.53	6.15	6.79
	Exp. 1 Mean		7.13	5.65	6.34	6.79
	2[d]	7	6.88	7.20	7.20	7.63
		12	6.67	6.95	6.76	7.23
		13	7.80	7.95	6.48	5.99
	Exp. 2 Mean		7.12	7.37	6.81	6.95
	Overall Mean		7.12	6.51	6.58	6.87

[a]Plated on violet red bile agar (VRBA)

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B9. Study 1 weekly fecal counts of lactobacilli[a] (Log_{10} cfu/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	9.60	9.92	7.82	8.11
		8	10.00	9.60	9.15	9.40
		13	9.83	9.18	9.59	9.11
	Exp. 1 Mean		9.81	9.57	8.85	8.88
	2[d]	1	9.88	9.65	9.78	9.63
		3	9.08	9.04	9.38	9.45
		14	9.54	9.71	9.26	9.51
	Exp. 2 Mean		9.50	9.47	9.47	9.53
	Overall Mean		9.65	9.52	9.16	9.20
L. reuteri DS-33	1[c]	2	9.84	9.51	7.34	8.08
		9	9.72	8.93	9.30	8.99
		12	9.85	9.00	9.23	9.62
	Exp. 1 Mean		9.80	9.14	8.62	8.90
	2[d]	2	9.81	9.30	9.36	9.11
		8	9.93	9.15	9.57	9.00
		15	9.46	10.08	9.18	9.43
	Exp. 2 Mean		9.73	9.51	9.37	9.18
	Overall Mean		9.77	9.33	9.00	9.04
L. reuteri WB-74	1[c]	1	9.80	9.49	9.30	8.63
		10	9.72	7.20	8.15	9.28
		14	8.87	7.89	8.98	9.18
	Exp. 1 Mean		9.46	8.19	8.81	9.03
	2[d]	4	9.46	9.08	8.87	9.15
		5	9.83	9.32	8.08	9.43
		11	9.63	9.26	9.58	9.57
	Exp. 2 Mean		9.64	9.22	8.84	9.38
	Overall Mean		9.55	8.71	8.83	9.21
L. reuteri WB-75	1[c]	4	9.51	9.85	8.23	8.28
		7	9.34	9.53	8.26	8.90
		11	8.98	8.32	8.98	9.36
	Exp. 1 Mean		9.28	9.23	8.49	8.85
	2[d]	6	9.67	9.34	9.61	9.65
		9	9.59	8.58	9.34	9.56
		10	9.34	9.41	9.69	9.87
	Exp. 2 Mean		9.54	9.11	9.55	9.69
	Overall Mean		9.41	9.17	9.02	9.27
L. acidophilus L-23	1[c]	5	9.45	9.28	9.11	9.61
		6	9.08	9.45	7.67	9.41
		15	9.74	9.72	7.94	10.11
	Exp. 1 Mean		9.42	9.48	8.24	9.71
	2[d]	7	9.00	8.77	8.57	9.00
		12	9.08	9.00	9.11	9.08
		13	9.53	9.11	7.91	9.32
	Exp. 2 Mean		9.20	8.96	8.53	9.13
	Overall Mean		9.31	9.22	8.39	9.42

[a]Plated on *Lactobacillus* selection agar (LBSA)

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B10. Study 1 weekly fecal counts of *Campylobacter* [a] (Log_{10} cfu/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0[c]	Week 1	Week 2	Week 3
Control	1[d]	3	NA	4.00	4.00	4.69
		8	NA	4.54	4.00	4.59
		13	NA	4.00	4.00	4.00
	Exp. 1 Mean		NA	4.18	4.00	4.43
	2[e]	1	4.00	4.00	4.00	4.00
		3	6.30	4.34	4.00	4.54
		14	5.45	4.65	4.53	4.54
	Exp. 2 Mean		5.25	4.33	4.18	4.36
	Overall Mean		5.25	4.26	4.09	4.39
L. reuteri DS-33	1[d]	2	NA	4.00	4.00	4.00
		9	NA	4.59	4.00	4.00
		12	NA	4.00	4.00	4.00
	Exp. 1 Mean		NA	4.20	4.00	4.00
	2[e]	2	4.48	4.00	4.79	4.00
		8	4.00	4.57	4.00	4.00
		15	4.00	4.00	4.00	4.56
	Exp. 2 Mean		4.16	4.19	4.26	4.19
	Overall Mean		4.16	4.19	4.13	4.09
L. reuteri WB-74	1[d]	1	NA	4.40	4.00	4.00
		10	NA	6.90	6.46	4.54
		14	NA	4.71	4.00	4.48
	Exp. 1 Mean		NA	4.79	4.56	4.19
	2[e]	4	4.00	4.00	4.00	4.41
		5	4.00	4.00	4.00	4.00
		11	5.76	4.64	4.18	4.43
	Exp. 2 Mean		4.37	4.10	4.81	4.19
	Overall Mean		4.37	4.45	4.69	4.19
L. reuteri WB-75	1[d]	4	NA	4.45	4.57	4.00
		7	NA	4.57	4.60	5.51
		11	NA	4.46	4.38	4.00
	Exp. 1 Mean		NA	4.49	4.52	4.50
	2[e]	6	5.94	4.00	4.00	4.41
		9	4.00	4.00	4.00	4.00
		10	4.00	4.48	4.04	4.74
	Exp. 2 Mean		4.65	4.16	4.01	4.38
	Overall Mean		4.65	4.33	4.27	4.44
L. acidophilus L-23	1[d]	5	NA	4.00	4.61	4.56
		6	NA	4.49	4.43	4.00
		15	NA	5.88	4.64	4.00
	Exp. 1 Mean		NA	4.79	4.56	4.19
	2[e]	7	4.41	4.30	5.90	4.58
		12	4.00	4.00	4.53	4.00
		13	4.71	4.00	4.00	4.00
	Exp. 2 Mean		4.37	4.10	4.81	4.19
	Overall Mean		4.37	4.45	4.69	4.19

[a]Testing was done on the Bax® system

[b]Description of treatments, experiments, and pigs - see Table B2

[c]NA - not analyzed

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B11. Study 1 testing of weekly fecal cultures of *Campylobacter* positives[a]

Treatment[b]	Exp.[b]	Pig[b]	Day 0[c]	Week 1	Week 2	Week 3
Control	1[d]	3	NA	-	-	+
		8	NA	+	-	+
		13	NA	-	-	-
		Exp. 1 Mean	NA	1	0	2
	2[e]	1	-	-	-	-
		3	+	+	-	+
		14	+	+	+	+
		Exp. 2 Mean	2	2	1	2
		Overall Mean	2	3	1	4
L. reuteri DS-33	1[d]	2	NA	-	-	-
		9	NA	+	-	-
		12	NA	-	-	-
		Exp. 1 Mean	NA	1	0	0
	2[e]	2	+	-	+	-
		8	-	+	-	-
		15	-	-	-	+
		Exp. 2 Mean	1	1	1	1
		Overall Mean	1	2	1	1
L. reuteri WB-74	1[d]	1	NA	+	-	-
		10	NA	+	+	+
		14	NA	+	-	+
		Exp. 1 Mean	NA	3	1	2
	2[e]	4	-	-	-	+
		5	-	-	-	-
		11	+	+	+	+
		Exp. 2 Mean	1	1	1	2
		Overall Mean	1	4	2	4
L. reuteri WB-75	1[d]	4	NA	+	+	-
		7	NA	+	+	+
		11	NA	+	+	-
		Exp. 1 Mean	NA	3	3	1
	2[e]	6	+	-	-	+
		9	-	-	-	-
		10	-	+	+	+
		Exp. 2 Mean	1	1	1	2
		Overall Mean	1	4	4	3
L. acidophilus L-23	1[d]	5	NA	-	+	+
		6	NA	+	+	-
		15	NA	+	+	-
		Exp. 1 Mean	NA	2	3	1
	2[e]	7	+	+	+	+
		12	-	-	+	-
		13	+	-	-	-
		Exp. 2 Mean	2	1	2	1
		Overall Mean	2	3	5	2

[a]Testing was done on the Bax® system

[b]Description of treatments, experiments, and pigs - see Table B2

[c]NA - not analyzed

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B12. Study 1 testing of weekly fecal enrichment cultures of *Campylobacter* positives[a]

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	+	+	+	+
		8	+	+	+	+
		13	+	+	+	+
		Exp. 1 Mean	3	3	3	3
	2[d]	1	-	-	-	-
		3	+	+	+	+
		14	+	+	+	+
		Exp. 2 Mean	2	2	2	2
		Overall Mean	5	5	5	5
L. reuteri DS-33	1[c]	2	+	+	+	+
		9	+	+	+	+
		12	+	+	+	+
		Exp. 1 Mean	3	3	3	3
	2[d]	2	+	+	+	+
		8	-	+	+	+
		15	+	+	+	-
		Exp. 2 Mean	2	3	3	2
		Overall Mean	5	6	6	5
L. reuteri WB-74	1[c]	1	+	+	+	-
		10	+	+	+	+
		14	+	+	+	+
		Exp. 1 Mean	3	3	3	2
	2[d]	4	+	+	+	+
		5	-	-	-	-
		11	+	+	+	-
		Exp. 2 Mean	2	2	2	1
		Overall Mean	5	5	5	3
L. reuteri WB-75	1[c]	4	+	+	-	+
		7	+	+	+	+
		11	+	+	+	+
		Exp. 1 Mean	3	3	2	3
	2[d]	6	+	+	+	+
		9	+	+	+	-
		10	+	+	+	+
		Exp. 2 Mean	3	3	3	2
		Overall Mean	6	6	5	5
L. acidophilus L-23	1[c]	5	+	+	+	+
		6	+	+	+	+
		15	+	+	-	+
		Exp. 1 Mean	3	3	2	3
	2[d]	7	+	+	+	+
		12	-	+	+	-
		13	+	+	-	-
		Exp. 2 Mean	2	3	2	1
		Overall Mean	5	6	4	4

[a]Testing was done on the Bax® system

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B13. Study 1 testing of weekly fecal enrichment cultures of *Salmonella* positives[a]

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	-	-	-	-
		8	-	-	-	-
		13	-	-	-	-
		Exp. 1 Mean	0	0	0	0
	2[d]	1	-	-	-	-
		3	-	-	-	-
		14	-	-	-	-
		Exp. 2 Mean	0	0	0	0
		Overall Mean	0	0	0	0
L. reuteri DS-33	1[c]	2	-	-	-	-
		9	-	-	-	-
		12	-	-	-	-
		Exp. 1 Mean	0	0	0	0
	2[d]	2	-	-	-	-
		8	-	-	-	-
		15	-	-	-	-
		Exp. 2 Mean	0	0	0	0
		Overall Mean	0	0	0	0
L. reuteri WB-74	1[c]	1	-	-	-	-
		10	-	-	-	-
		14	-	-	-	-
		Exp. 1 Mean	0	0	0	0
	2[d]	4	-	-	-	-
		5	-	-	-	-
		11	-	-	-	-
		Exp. 2 Mean	0	0	0	0
		Overall Mean	0	0	0	0
L. reuteri WB-75	1[c]	4	-	-	-	-
		7	-	-	-	-
		11	-	-	-	-
		Exp. 1 Mean	0	0	0	0
	2[d]	6	-	-	-	-
		9	-	-	-	-
		10	-	-	-	-
		Exp. 2 Mean	0	0	0	0
		Overall Mean	0	0	0	0
L. acidophilus L-23	1[c]	5	-	-	-	-
		6	-	-	-	-
		15	-	-	-	-
		Exp. 1 Mean	0	0	0	0
	2[d]	7	-	-	-	-
		12	-	-	-	-
		13	-	-	-	-
		Exp. 2 Mean	0	0	0	0
		Overall Mean	0	0	0	0

[a]Testing was done on the Bax® system

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B14. Study 1 weekly glucose levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	135	117	116	123
		8	122	112	109	120
		13	126	111	95	113
	Exp. 1 Mean		128	113	107	119
	2[c]	1	111	117	103	133
		3	131	112	119	140
		14	110	111	107	116
	Exp. 2 Mean		117	113	110	130
	Overall Mean		123	113	108	124
L. reuteri DS-33	1[b]	2	124	127	117	130
		9	129	120	144	142
		12	110	86	105	124
	Exp. 1 Mean		120	111	122	132
	2[c]	2	124	127	111	122
		8	99	120	114	106
		15	96	86	133	104
	Exp. 2 Mean		106	111	119	111
	Overall Mean		112	111	121	121
L. reuteri WB-74	1[b]	1	126	131	121	113
		10	133	141	135	133
		14	106	105	101	90
	Exp. 1 Mean		120	126	119	112
	2[c]	4	105	131	108	152
		5	103	141	101	136
		11	124	105	125	128
	Exp. 2 Mean		111	126	111	139
	Overall Mean		114	126	115	125
L. reuteri WB-75	1[b]	4	126	112	114	128
		7	123	116	117	121
		11	104	101	109	118
	Exp. 1 Mean		118	110	113	122
	2[c]	6	109	112	104	111
		9	119	116	102	127
		10	119	101	108	145
	Exp. 2 Mean		116	110	105	128
	Overall Mean		117	110	109	125
L. acidophilus L-23	1[b]	5	123	120	118	118
		6	132	112	103	115
		15	116	131	106	125
	Exp. 1 Mean		124	121	109	119
	2[c]	7	99	120	126	131
		12	101	112	97	140
		13	109	131	105	176
	Exp. 2 Mean		103	121	109	149
	Overall Mean		113	121	109	134

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B15. Study 1 weekly BUN[a] levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	9	8	9	9
		8	12	8	9	7
		13	9	15	6	8
	Exp. 1 Mean		10	10	8	8
	2[d]	1	11	8	6	7
		3	10	8	6	8
		14	8	15	8	10
	Exp. 2 Mean		10	10	7	8
	Overall Mean		10	10	7	8
L. reuteri DS-33	1[c]	2	7	8	8	9
		9	9	13	10	9
		12	10	8	9	9
	Exp. 1 Mean		9	10	9	9
	2[d]	2	7	8	8	9
		8	7	13	7	9
		15	7	8	6	9
	Exp. 2 Mean		7	10	7	9
	Overall Mean		8	10	8	9
L. reuteri WB-74	1[c]	1	6	5	7	8
		10	9	8	7	7
		14	11	16	10	12
	Exp. 1 Mean		9	10	8	9
	2[d]	4	10	5	7	14
		5	7	8	7	8
		11	13	16	7	9
	Exp. 2 Mean		10	10	7	10
	Overall Mean		9	10	8	10
L. reuteri WB-75	1[c]	4	7	11	10	8
		7	6	6	7	7
		11	6	6	8	6
	Exp. 1 Mean		6	8	8	7
	2[d]	6	8	11	10	11
		9	7	6	8	8
		10	7	6	9	7
	Exp. 2 Mean		7	8	9	9
	Overall Mean		7	8	9	8
L. acidophilus L-23	1[c]	5	9	9	12	11
		6	9	10	7	6
		15	7	7	6	5
	Exp. 1 Mean		8	9	8	7
	2[d]	7	14	9	9	9
		12	11	10	8	10
		13	9	7	5	10
	Exp. 2 Mean		11	9	7	10
	Overall Mean		10	9	8	9

[a]BUN - blood urea nitrogen

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B16. Study 1 weekly creatinine levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	1.0	0.9	1.0	1.0
		8	0.9	0.9	0.9	1.0
		13	0.8	1.1	0.9	1.1
	Exp. 1 Mean		0.9	1.0	0.9	1.0
	2[c]	1	1.2	0.9	1.0	1.1
		3	1.0	0.9	1.1	1.0
		14	1.0	1.1	1.1	1.1
	Exp. 2 Mean		1.1	1.0	1.1	1.1
	Overall Mean		1.0	1.0	1.0	1.1
L. reuteri DS-33	1[b]	2	0.9	1.0	1.1	1.1
		9	1.0	1.2	1.0	1.0
		12	0.8	0.8	0.9	0.9
	Exp. 1 Mean		0.9	1.0	1.0	1.0
	2[c]	2	0.9	1.0	1.2	1.3
		8	0.9	1.2	1.2	1.0
		15	1.0	0.8	0.9	0.9
	Exp. 2 Mean		0.9	1.0	1.1	1.1
	Overall Mean		0.9	1.0	1.1	1.0
L. reuteri WB-74	1[b]	1	0.9	0.8	0.9	0.9
		10	0.9	1.0	1.0	1.0
		14	0.9	1.2	1.0	1.0
	Exp. 1 Mean		0.9	1.0	1.0	1.0
	2[c]	4	1.0	0.8	1.3	1.7
		5	1.0	1.0	1.0	1.2
		11	1.1	1.2	1.1	1.1
	Exp. 2 Mean		1.0	1.0	1.1	1.3
	Overall Mean		1.0	1.0	1.1	1.2
L. reuteri WB-75	1[b]	4	0.9	0.9	1.1	1.1
		7	0.9	0.9	0.9	1.1
		11	0.9	1.0	0.9	1.0
	Exp. 1 Mean		0.9	0.9	1.0	1.1
	2[c]	6	1.0	0.9	1.2	1.2
		9	1.0	0.9	1.1	1.2
		10	0.9	1.0	1.3	1.2
	Exp. 2 Mean		1.0	0.9	1.2	1.2
	Overall Mean		0.9	0.9	1.1	1.1
L. acidophilus L-23	1[b]	5	1.0	1.2	1.2	1.1
		6	0.9	1.1	1.0	1.0
		15	0.7	0.8	0.9	0.9
	Exp. 1 Mean		0.9	1.0	1.0	1.0
	2[c]	7	1.4	1.2	1.2	1.2
		12	1.2	1.1	1.0	1.4
		13	1.1	0.8	1.0	1.4
	Exp. 2 Mean		1.2	1.0	1.1	1.3
	Overall Mean		1.1	1.0	1.1	1.2

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B17. Study 1 weekly BUN[a]:creatinine ratio levels

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	9.8	9.3	9.0	8.6
		8	13.6	8.9	10.7	6.4
		13	11.3	13.4	6.8	7.4
	Exp. 1 Mean		11.6	10.5	8.8	7.5
	2[d]	1	8.9	9.3	6.1	6.3
		3	10.7	8.9	5.9	8.1
		14	7.6	13.4	6.9	8.9
	Exp. 2 Mean		9.1	10.5	6.3	7.8
	Overall Mean		10.3	10.5	7.6	7.6
L. reuteri DS-33	1[c]	2	7.9	7.8	7.1	8.3
		9	9.1	11.3	9.5	8.7
		12	12.1	9.6	10.1	9.7
	Exp. 1 Mean		9.7	9.6	8.9	8.9
	2[d]	2	7.3	7.8	6.4	6.6
		8	8.1	11.3	6.4	8.8
		15	7.0	9.6	6.8	10.0
	Exp. 2 Mean		7.5	9.6	6.5	8.5
	Overall Mean		8.6	9.6	7.7	8.7
L. reuteri WB-74	1[c]	1	7.0	6.7	8.0	8.8
		10	10.5	7.6	6.7	6.8
		14	11.9	12.9	10.3	12.0
	Exp. 1 Mean		9.8	9.1	8.3	9.2
	2[d]	4	9.7	6.7	5.6	8.4
		5	6.6	7.6	7.0	6.2
		11	12.0	12.9	6.5	7.8
	Exp. 2 Mean		9.4	9.1	6.4	7.5
	Overall Mean		9.6	9.1	7.4	8.3
L. reuteri WB-75	1[c]	4	7.3	11.7	9.1	7.2
		7	6.9	6.8	7.4	6.0
		11	6.6	6.7	8.7	5.7
	Exp. 1 Mean		6.9	8.4	8.4	6.3
	2[d]	6	8.4	11.7	8.3	8.9
		9	7.3	6.8	7.2	6.6
		10	7.3	6.7	7.4	5.8
	Exp. 2 Mean		7.7	8.4	7.6	7.1
	Overall Mean		7.3	8.4	8.0	6.7
L. acidophilus L-23	1[c]	5	8.5	8.0	10.3	9.7
		6	10.0	9.2	7.0	5.4
		15	10.1	8.5	6.4	5.6
	Exp. 1 Mean		9.5	8.6	7.9	6.9
	2[d]	7	9.5	8.0	7.6	7.1
		12	9.1	9.2	8.0	7.0
		13	8.7	8.5	4.9	6.7
	Exp. 2 Mean		9.1	8.6	6.8	6.9
	Overall Mean		9.3	8.6	7.4	6.9

[a]BUN - blood urea nitrogen

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B18. Study 1 weekly sodium levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	151	137	143	144
		8	140	140	140	143
		13	135	137	142	145
	Exp. 1 Mean		142	138	142	144
	2[c]	1	139	137	135	147
		3	132	140	147	136
		14	137	137	138	137
	Exp. 2 Mean		136	138	140	140
	Overall Mean		139	138	141	142
L. reuteri DS-33	1[b]	2	151	141	144	145
		9	142	140	140	141
		12	139	139	142	142
	Exp. 1 Mean		144	140	142	143
	2[c]	2	135	141	144	154
		8	134	140	142	129
		15	134	139	138	125
	Exp. 2 Mean		134	140	141	136
	Overall Mean		139	140	142	139
L. reuteri WB-74	1[b]	1	142	140	143	143
		10	142	140	142	150
		14	138	137	140	144
	Exp. 1 Mean		141	139	142	146
	2[c]	4	136	140	141	152
		5	137	140	134	149
		11	133	137	144	139
	Exp. 2 Mean		135	139	140	147
	Overall Mean		138	139	141	146
L. reuteri WB-75	1[b]	4	145	142	143	146
		7	146	142	142	145
		11	140	137	137	143
	Exp. 1 Mean		144	140	141	145
	2[c]	6	139	142	143	148
		9	138	142	131	143
		10	137	137	140	144
	Exp. 2 Mean		138	140	138	145
	Overall Mean		141	140	139	145
L. acidophilus L-23	1[b]	5	152	139	143	143
		6	146	142	143	144
		15	136	138	140	142
	Exp. 1 Mean		145	140	142	143
	2[c]	7	138	139	151	146
		12	140	142	134	142
		13	137	138	136	149
	Exp. 2 Mean		138	140	140	146
	Overall Mean		142	140	141	144

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B19. Study 1 weekly potassium levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	10.6	8.8	9.7	12.3
		8	10.1	8.8	9.0	10.8
		13	9.3	10.0	8.7	10.4
	Exp. 1 Mean		10.0	9.2	9.1	11.2
	2[c]	1	9.6	8.8	9.2	10.0
		3	11.5	8.8	9.9	9.9
		14	9.9	10.0	9.3	9.6
	Exp. 2 Mean		10.3	9.2	9.5	9.8
	Overall Mean		10.2	9.2	9.3	10.5
L. reuteri DS-33	1[b]	2	9.9	7.9	9.0	10.4
		9	9.7	9.7	9.7	11.7
		12	7.5	8.0	8.3	9.3
	Exp. 1 Mean		9.0	8.5	9.0	10.5
	2[c]	2	9.1	7.9	9.2	10.2
		8	9.7	9.7	7.6	8.1
		15	9.2	8.0	9.1	8.8
	Exp. 2 Mean		9.3	8.5	8.6	9.0
	Overall Mean		9.2	8.5	8.8	9.8
L. reuteri WB-74	1[b]	1	11.0	9.3	9.0	11.0
		10	9.6	10.4	9.9	13.0
		14	8.7	8.4	8.7	10.5
	Exp. 1 Mean		9.8	9.4	9.2	11.5
	2[c]	4	8.6	9.3	9.1	10.0
		5	9.4	10.4	8.0	9.7
		11	9.6	8.4	9.3	9.9
	Exp. 2 Mean		9.2	9.4	8.8	9.9
	Overall Mean		9.5	9.4	9.0	10.7
L. reuteri WB-75	1[b]	4	9.3	10.0	8.6	10.8
		7	10.0	9.3	9.2	11.5
		11	8.2	8.1	9.4	9.6
	Exp. 1 Mean		9.2	9.1	9.1	10.6
	2[c]	6	8.9	10.0	8.5	10.5
		9	10.8	9.3	9.5	9.1
		10	9.5	8.1	9.7	10.2
	Exp. 2 Mean		9.7	9.1	9.2	9.9
	Overall Mean		9.5	9.1	9.2	10.3
L. acidophilus L-23	1[b]	5	9.7	9.0	9.5	10.6
		6	9.0	9.1	9.3	10.9
		15	8.0	8.4	8.8	10.0
	Exp. 1 Mean		8.9	8.8	9.2	10.5
	2[c]	7	9.6	9.0	10.2	10.4
		12	9.8	9.1	9.5	9.0
		13	10.0	8.4	8.6	10.9
	Exp. 2 Mean		9.8	8.8	9.4	10.1
	Overall Mean		9.4	8.8	9.3	10.3

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B20. Study 1 weekly chloride levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	111	103	106	106
		8	107	104	105	107
		13	102	105	107	107
	Exp. 1 Mean		107	104	106	107
	2[c]	1	105	103	101	110
		3	101	104	107	104
		14	103	105	100	102
	Exp. 2 Mean		103	104	103	105
	Overall Mean		105	104	104	106
L. reuteri DS-33	1[b]	2	113	105	105	106
		9	108	110	108	109
		12	102	105	106	104
	Exp. 1 Mean		108	107	106	106
	2[c]	2	102	105	106	111
		8	101	110	102	96
		15	100	105	103	97
	Exp. 2 Mean		101	107	104	101
	Overall Mean		104	107	105	104
L. reuteri WB-74	1[b]	1	108	106	103	103
		10	106	109	107	109
		14	102	104	104	103
	Exp. 1 Mean		105	106	105	105
	2[c]	4	102	106	104	111
		5	106	109	102	113
		11	103	104	107	106
	Exp. 2 Mean		104	106	104	110
	Overall Mean		105	106	105	108
L. reuteri WB-75	1[b]	4	106	105	104	105
		7	106	107	107	109
		11	103	107	107	104
	Exp. 1 Mean		105	106	106	106
	2[c]	6	105	105	104	109
		9	102	107	98	104
		10	103	107	100	105
	Exp. 2 Mean		103	106	101	106
	Overall Mean		104	106	103	106
L. acidophilus L-23	1[b]	5	114	104	106	105
		6	107	105	107	107
		15	101	101	106	107
	Exp. 1 Mean		107	103	106	106
	2[c]	7	104	104	109	108
		12	105	105	101	106
		13	102	101	103	112
	Exp. 2 Mean		104	103	104	109
	Overall Mean		106	103	105	108

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B21. Study 1 weekly carbon dioxide levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	25	23	24	23
		8	20	25	26	20
		13	20	16	20	21
	Exp. 1 Mean		22	21	23	21
	2[c]	1	21	23	20	24
		3	16	25	28	20
		14	28	16	28	23
	Exp. 2 Mean		22	21	25	22
	Overall Mean		22	21	24	22
L. reuteri DS-33	1[b]	2	25	21	22	24
		9	22	18	20	16
		12	26	23	23	24
	Exp. 1 Mean		24	21	22	21
	2[c]	2	27	21	27	29
		8	24	18	27	23
		15	24	23	24	21
	Exp. 2 Mean		25	21	26	24
	Overall Mean		25	21	24	23
L. reuteri WB-74	1[b]	1	16	20	27	27
		10	24	16	25	21
		14	26	24	22	25
	Exp. 1 Mean		22	20	25	24
	2[c]	4	22	20	23	24
		5	19	16	21	18
		11	18	24	23	17
	Exp. 2 Mean		20	20	22	20
	Overall Mean		21	20	24	22
L. reuteri WB-75	1[b]	4	25	26	24	21
		7	21	23	22	19
		11	26	19	20	21
	Exp. 1 Mean		24	23	22	20
	2[c]	6	25	26	28	27
		9	21	23	19	23
		10	25	19	23	21
	Exp. 2 Mean		24	23	23	24
	Overall Mean		24	23	23	22
L. acidophilus L-23	1[b]	5	26	25	24	22
		6	26	24	23	21
		15	24	23	21	19
	Exp. 1 Mean		25	24	23	21
	2[c]	7	22	25	23	24
		12	22	24	21	18
		13	22	23	19	15
	Exp. 2 Mean		22	24	21	19
	Overall Mean		24	24	22	20

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B22. Study 1 weekly anion gap levels

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	25.1	19.6	22.7	27.4
		8	22.7	19.6	18.1	26.0
		13	22.4	26.2	23.2	26.8
	Exp. 1 Mean		23.4	21.8	21.3	26.7
	2[c]	1	22.4	19.6	23.4	24.1
		3	26.1	19.6	21.3	22.3
		14	16.0	26.2	18.8	21.3
	Exp. 2 Mean		21.5	21.8	21.2	22.6
	Overall Mean		22.5	21.8	21.3	24.7
L. reuteri DS-33	1[b]	2	23.2	23.1	25.8	25.8
		9	21.8	22.4	22.0	27.4
		12	17.2	19.3	21.5	22.6
	Exp. 1 Mean		20.7	21.6	23.1	25.3
	2[c]	2	15.8	23.1	20.3	24.7
		8	17.8	22.4	20.0	18.1
		15	19.2	19.3	20.8	16.1
	Exp. 2 Mean		17.6	21.6	20.4	19.6
	Overall Mean		19.2	21.6	21.7	22.5
L. reuteri WB-74	1[b]	1	28.9	23.9	21.5	23.9
		10	21.8	25.2	19.7	32.4
		14	17.6	17.5	22.9	25.9
	Exp. 1 Mean		22.8	22.2	21.4	27.4
	2[c]	4	20.6	23.9	22.6	27.6
		5	21.9	25.2	18.9	27.2
		11	21.8	17.5	22.8	26.6
	Exp. 2 Mean		21.4	22.2	21.4	27.1
	Overall Mean		22.1	22.2	21.4	27.3
L. reuteri WB-75	1[b]	4	23.8	21.7	23.6	30.5
		7	28.4	20.9	21.5	28.7
		11	18.9	19.7	19.9	27.9
	Exp. 1 Mean		23.7	20.8	21.7	29.0
	2[c]	6	18.9	21.7	18.7	21.9
		9	26.2	20.9	23.0	25.7
		10	18.8	19.7	26.0	27.8
	Exp. 2 Mean		21.3	20.8	22.6	25.1
	Overall Mean		22.5	20.8	22.1	27.1
L. acidophilus L-23	1[b]	5	22.0	19.3	23.1	26.6
		6	21.9	22.6	21.4	27.6
		15	18.9	22.4	22.0	26.3
	Exp. 1 Mean		20.9	21.4	22.2	26.8
	2[c]	7	21.4	19.3	28.5	23.2
		12	22.8	22.6	21.3	26.0
		13	22.3	22.4	23.1	33.2
	Exp. 2 Mean		22.2	21.4	24.3	27.5
	Overall Mean		21.6	21.4	23.2	27.2

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B23. Study 1 weekly calcium levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	11.2	10.7	10.0	10.4
		8	10.8	11.7	10.2	10.0
		13	10.8	10.2	9.6	11.0
	Exp. 1 Mean		10.9	10.9	9.9	10.5
	2[c]	1	10.9	10.7	10.1	11.1
		3	10.1	11.7	10.7	9.2
		14	9.8	10.2	10.0	9.6
	Exp. 2 Mean		10.3	10.9	10.3	10.0
	Overall Mean		10.6	10.9	10.1	10.2
L. reuteri DS-33	1[b]	2	11.7	10.6	11.0	10.9
		9	11.0	10.3	10.5	11.1
		12	12.8	10.2	10.6	10.7
	Exp. 1 Mean		11.8	10.4	10.7	10.9
	2[c]	2	10.1	10.6	10.7	11.1
		8	9.9	10.3	10.5	8.5
		15	10.2	10.2	9.8	8.3
	Exp. 2 Mean		10.1	10.4	10.3	9.3
	Overall Mean		11.0	10.4	10.5	10.1
L. reuteri WB-74	1[b]	1	10.6	10.7	10.4	10.6
		10	10.2	10.2	10.3	11.5
		14	9.9	9.9	10.0	11.0
	Exp. 1 Mean		10.2	10.3	10.2	11.0
	2[c]	4	9.8	10.7	10.0	11.6
		5	11.0	10.2	9.4	10.3
		11	9.3	9.9	10.6	9.7
	Exp. 2 Mean		10.0	10.3	10.0	10.5
	Overall Mean		10.1	10.3	10.1	10.8
L. reuteri WB-75	1[b]	4	11.8	10.8	10.5	10.8
		7	11.7	10.8	10.5	11.3
		11	10.5	9.7	10.3	11.1
	Exp. 1 Mean		11.3	10.4	10.4	11.1
	2[c]	6	9.8	10.8	10.1	10.5
		9	10.4	10.8	9.7	10.6
		10	10.0	9.7	10.3	10.4
	Exp. 2 Mean		10.1	10.4	10.0	10.5
	Overall Mean		10.7	10.4	10.2	10.8
L. acidophilus L-23	1[b]	5	12.9	11.1	11.5	11.0
		6	11.4	10.9	10.3	10.7
		15	10.5	10.1	9.9	10.6
	Exp. 1 Mean		11.6	10.7	10.6	10.8
	2[c]	7	9.9	11.1	11.4	10.6
		12	10.5	10.9	9.3	9.8
		13	9.9	10.1	9.4	10.8
	Exp. 2 Mean		10.1	10.7	10.0	10.4
	Overall Mean		10.9	10.7	10.3	10.6

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B24. Study 1 weekly total protein levels (g/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	5.1	3.9	4.8	5.3
		8	5.2	4.6	4.3	5.1
		13	4.9	4.8	4.3	5.6
	Exp. 1 Mean		5.1	4.4	4.5	5.3
	2[c]	1	4.4	3.9	4.6	5.5
		3	5.1	4.6	5.5	4.8
		14	4.3	4.8	4.3	4.8
	Exp. 2 Mean		4.6	4.4	4.8	5.0
	Overall Mean		4.8	4.4	4.6	5.2
L. reuteri DS-33	1[b]	2	5.1	4.6	5.1	5.6
		9	4.5	4.1	4.0	4.9
		12	4.7	4.7	4.9	5.3
	Exp. 1 Mean		4.8	4.5	4.7	5.3
	2[c]	2	3.9	4.6	4.9	5.9
		8	4.2	4.1	5.2	3.9
		15	3.8	4.7	4.9	3.6
	Exp. 2 Mean		4.0	4.5	5.0	4.5
	Overall Mean		4.4	4.5	4.8	4.9
L. reuteri WB-74	1[b]	1	4.9	4.8	5.1	5.6
		10	4.5	4.4	4.6	5.8
		14	4.5	4.3	4.7	5.7
	Exp. 1 Mean		4.5	4.5	4.8	5.7
	2[c]	4	4.5	4.8	5.3	6.2
		5	4.6	4.4	4.6	5.5
		11	4.5	4.3	5.1	4.6
	Exp. 2 Mean		4.5	4.5	5.0	5.4
	Overall Mean		4.5	4.5	4.9	5.6
L. reuteri WB-75	1[b]	4	4.9	4.9	4.6	5.2
		7	4.9	4.1	4.5	5.2
		11	4.8	4.4	4.7	5.6
	Exp. 1 Mean		4.9	4.5	4.6	5.3
	2[c]	6	4.5	4.9	5.0	5.4
		9	4.9	4.1	4.4	4.7
		10	4.3	4.4	4.8	5.0
	Exp. 2 Mean		4.6	4.5	4.7	5.0
	Overall Mean		4.7	4.5	4.7	5.2
L. acidophilus L-23	1[b]	5	5.2	4.6	5.1	5.8
		6	4.9	5.1	4.8	5.3
		15	4.7	5.1	5.0	5.4
	Exp. 1 Mean		4.9	4.9	5.0	5.5
	2[c]	7	4.6	4.6	5.6	5.6
		12	4.7	5.1	4.8	5.3
		13	4.3	5.1	4.5	6.3
	Exp. 2 Mean		4.5	4.9	5.0	5.7
	Overall Mean		4.7	4.9	5.0	5.6

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B25. Study 1 weekly albumin levels (g/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	3.2	2.3	2.8	3.5
		8	2.9	2.4	2.4	3.2
		13	2.3	2.3	2.2	3.2
	Exp. 1 Mean		2.8	2.3	2.5	3.3
	2[c]	1	2.7	2.3	2.9	3.8
		3	2.7	2.4	3.2	2.7
		14	2.3	2.3	2.3	2.6
	Exp. 2 Mean		2.6	2.3	2.8	3.0
	Overall Mean		2.7	2.3	2.6	3.2
L. reuteri DS-33	1[b]	2	3.3	2.9	3.3	3.8
		9	2.6	2.3	2.4	3.4
		12	3.0	3.2	3.3	3.8
	Exp. 1 Mean		3.0	2.8	3.0	3.7
	2[c]	2	2.1	2.9	3.1	3.8
		8	2.4	2.3	3.3	2.3
		15	1.9	3.2	2.7	2.0
	Exp. 2 Mean		2.1	2.8	3.0	2.7
	Overall Mean		2.6	2.8	3.0	3.2
L. reuteri WB-74	1[b]	1	3.0	3.2	3.3	3.8
		10	2.7	2.7	2.9	4.3
		14	2.5	2.3	2.5	3.2
	Exp. 1 Mean		2.6	2.7	2.9	3.8
	2[c]	4	2.4	3.2	2.8	3.5
		5	2.3	2.7	2.4	3.0
		11	2.4	2.3	3.2	3.0
	Exp. 2 Mean		2.4	2.7	2.8	3.2
	Overall Mean		2.5	2.7	2.9	3.5
L. reuteri WB-75	1[b]	4	3.0	3.0	3.0	3.6
		7	3.2	2.5	2.7	3.4
		11	2.6	2.3	2.7	3.7
	Exp. 1 Mean		2.9	2.6	2.8	3.6
	2[c]	6	2.5	3.0	2.9	3.4
		9	3.0	2.5	2.8	3.2
		10	2.6	2.3	2.8	2.9
	Exp. 2 Mean		2.7	2.6	2.8	3.2
	Overall Mean		2.8	2.6	2.8	3.4
L. acidophilus L-23	1[b]	5	3.5	3.0	3.6	4.2
		6	2.7	2.9	2.6	3.2
		15	2.7	2.9	3.0	3.4
	Exp. 1 Mean		3.0	2.9	3.1	3.6
	2[c]	7	2.3	3.0	3.4	3.5
		12	2.1	2.9	2.5	2.9
		13	2.7	2.9	2.8	4.2
	Exp. 2 Mean		2.4	2.9	2.9	3.5
	Overall Mean		2.7	2.9	3.0	3.6

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B26. Study 1 weekly globulin levels (g/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	1.9	1.6	1.9	1.7
		8	2.4	2.2	1.9	2.0
		13	2.6	2.5	2.1	2.4
	Exp. 1 Mean		2.3	2.1	2.0	2.0
	2[c]	1	1.7	1.6	1.7	1.7
		3	2.3	2.2	2.3	2.1
		14	2.0	2.5	2.0	2.2
	Exp. 2 Mean		2.0	2.1	2.0	2.0
	Overall Mean		2.2	2.1	2.0	2.0
L. reuteri DS-33	1[b]	2	1.9	1.7	1.8	1.8
		9	1.9	1.9	1.6	1.5
		12	1.8	1.5	1.6	1.5
	Exp. 1 Mean		1.9	1.7	1.7	1.6
	2[c]	2	1.8	1.7	1.9	2.1
		8	1.8	1.9	1.9	1.6
		15	1.9	1.5	2.1	1.6
	Exp. 2 Mean		1.8	1.7	2.0	1.8
	Overall Mean		1.8	1.7	1.8	1.7
L. reuteri WB-74	1[b]	1	1.9	1.6	1.7	1.8
		10	1.8	1.7	1.7	1.5
		14	2.0	2.0	2.1	2.4
	Exp. 1 Mean		1.9	1.8	1.8	1.9
	2[c]	4	2.2	1.6	2.5	2.7
		5	2.3	1.7	2.2	2.5
		11	2.0	2.0	1.9	1.5
	Exp. 2 Mean		2.2	1.8	2.2	2.2
	Overall Mean		2.0	1.8	2.0	2.1
L. reuteri WB-75	1[b]	4	1.9	1.9	1.7	1.6
		7	1.7	1.5	1.8	1.8
		11	2.2	2.1	1.9	1.9
	Exp. 1 Mean		1.9	1.8	1.8	1.8
	2[c]	6	2.0	1.9	2.1	2.1
		9	1.9	1.5	1.6	1.5
		10	1.7	2.1	2.0	2.1
	Exp. 2 Mean		1.9	1.8	1.9	1.9
	Overall Mean		1.9	1.8	1.9	1.8
L. acidophilus L-23	1[b]	5	1.7	1.6	1.5	1.6
		6	2.2	2.2	2.2	2.1
		15	2.0	2.2	2.0	2.0
	Exp. 1 Mean		2.0	2.0	1.9	1.9
	2[c]	7	2.3	1.6	2.2	2.1
		12	2.6	2.2	2.3	2.4
		13	1.7	2.2	1.7	2.1
	Exp. 2 Mean		2.2	2.0	2.1	2.2
	Overall Mean		2.1	2.0	2.0	2.1

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B27. Study 1 weekly albumin:globulin ratio levels

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	1.7	1.4	1.5	2.0
		8	1.2	1.1	1.2	1.6
		13	0.9	0.9	1.0	1.4
	Exp. 1 Mean		1.3	1.1	1.2	1.7
	2[c]	1	1.6	1.4	1.7	2.3
		3	1.2	1.1	1.4	1.3
		14	1.1	0.9	1.1	1.2
	Exp. 2 Mean		1.3	1.1	1.4	1.6
	Overall Mean		1.3	1.1	1.3	1.6
L. reuteri DS-33	1[b]	2	1.7	1.4	1.5	2.0
		9	1.2	1.1	1.2	1.6
		12	0.9	0.9	1.0	1.4
	Exp. 1 Mean		1.3	1.1	1.2	1.7
	2[c]	2	1.6	1.4	1.7	2.3
		8	1.2	1.1	1.4	1.3
		15	1.1	0.9	1.1	1.2
	Exp. 2 Mean		1.3	1.1	1.4	1.6
	Overall Mean		1.3	1.1	1.3	1.6
L. reuteri WB-74	1[b]	1	1.5	2.0	1.9	2.1
		10	1.5	1.6	1.7	2.8
		14	1.2	1.1	1.2	1.3
	Exp. 1 Mean		1.4	1.6	1.6	2.1
	2[c]	4	1.1	2.0	1.1	1.3
		5	1.0	1.6	1.1	1.2
		11	1.2	1.1	1.6	2.0
	Exp. 2 Mean		1.1	1.6	1.3	1.5
	Overall Mean		1.3	1.6	1.4	1.8
L. reuteri WB-75	1[b]	4	1.6	1.6	1.8	2.2
		7	1.9	1.7	1.5	1.9
		11	1.2	1.1	1.4	1.9
	Exp. 1 Mean		1.6	1.5	1.6	2.0
	2[c]	6	1.2	1.6	1.4	1.6
		9	1.6	1.7	1.8	2.2
		10	1.5	1.1	1.4	1.4
	Exp. 2 Mean		1.4	1.5	1.5	1.7
	Overall Mean		1.5	1.5	1.6	1.9
L. acidophilus L-23	1[b]	5	2.0	1.9	2.4	2.7
		6	1.2	1.3	1.2	1.5
		15	1.4	1.3	1.5	1.7
	Exp. 1 Mean		1.5	1.5	1.7	2.0
	2[c]	7	1.0	1.9	1.5	1.7
		12	0.8	1.3	1.1	1.2
		13	1.6	1.3	1.7	2.0
	Exp. 2 Mean		1.1	1.5	1.4	1.6
	Overall Mean		1.3	1.5	1.6	1.8

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B28. Experiment 1 weekly AST[a] levels (U/L)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	74	62	50	52
		8	84	82	62	55
		13	68	70	45	54
	Exp. 1 Mean		75	71	52	54
	2[d]	1	55	62	38	43
		3	64	82	42	39
		14	65	70	57	62
	Exp. 2 Mean		61	71	46	48
	Overall Mean		68	71	49	51
L. reuteri DS-33	1[c]	2	67	51	59	50
		9	73	57	41	46
		12	40	41	66	53
	Exp. 1 Mean		60	50	55	50
	2[d]	2	43	51	34	38
		8	57	57	46	43
		15	46	41	67	37
	Exp. 2 Mean		49	50	49	39
	Overall Mean		54	50	52	45
L. reuteri WB-74	1[c]	1	67	55	59	57
		10	41	49	50	50
		14	60	70	41	53
	Exp. 1 Mean		56	58	50	53
	2[d]	4	58	55	34	56
		5	55	49	35	60
		11	88	70	60	52
	Exp. 2 Mean		67	58	43	56
	Overall Mean		62	58	47	55
L. reuteri WB-75	1[c]	4	53	51	38	41
		7	87	67	55	59
		11	68	122	66	62
	Exp. 1 Mean		69	80	53	54
	2[d]	6	50	51	52	59
		9	76	67	44	47
		10	52	122	56	44
	Exp. 2 Mean		59	80	51	50
	Overall Mean		64	80	52	52
L. acidophilus L-23	1[c]	5	53	64	55	70
		6	57	67	48	45
		15	105	101	66	77
	Exp. 1 Mean		72	77	56	64
	2[d]	7	72	64	45	45
		12	97	67	59	65
		13	56	101	41	72
	Exp. 2 Mean		75	77	48	61
	Overall Mean		73	77	52	62

[a]AST - aspartate aminotransferase

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B29. Experiment 1 weekly ALT[a] levels (U/L)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	69	54	54	59
		8	66	54	54	59
		13	47	44	49	66
	Exp. 1 Mean		61	51	52	61
	2[d]	1	45	54	31	34
		3	30	54	40	25
		14	51	44	63	59
	Exp. 2 Mean		42	51	45	39
	Overall Mean		51	51	49	50
L. reuteri DS-33	1[c]	2	41	34	37	45
		9	71	75	51	58
		12	51	57	75	81
	Exp. 1 Mean		54	55	54	61
	2[d]	2	34	34	39	34
		8	37	75	36	28
		15	26	57	39	29
	Exp. 2 Mean		32	55	38	30
	Overall Mean		43	55	46	46
L. reuteri WB-74	1[c]	1	57	64	55	65
		10	43	45	38	53
		14	53	51	49	53
	Exp. 1 Mean		51	53	47	57
	2[d]	4	40	64	39	50
		5	38	45	33	34
		11	56	51	54	41
	Exp. 2 Mean		45	53	42	42
	Overall Mean		48	53	45	49
L. reuteri WB-75	1[c]	4	53	51	43	46
		7	61	53	45	50
		11	48	49	38	52
	Exp. 1 Mean		54	51	42	49
	2[d]	6	41	51	53	54
		9	43	53	50	55
		10	40	49	33	30
	Exp. 2 Mean		41	51	45	46
	Overall Mean		48	51	44	48
L. acidophilus L-23	1[c]	5	49	46	47	60
		6	50	49	43	42
		15	53	59	67	71
	Exp. 1 Mean		51	51	52	58
	2[d]	7	53	46	46	41
		12	39	49	37	30
		13	45	59	43	41
	Exp. 2 Mean		46	51	42	37
	Overall Mean		48	51	47	48

[a]ALT - alanine aminotransferase

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B30. Experiment 1 weekly ALKPhos[a] levels (U/L)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	392	220	179	226
		8	331	220	270	291
		13	280	213	196	247
	Exp. 1 Mean		334	218	215	255
	2[d]	1	225	220	179	204
		3	151	220	246	156
		14	231	213	203	198
	Exp. 2 Mean		202	218	209	186
	Overall Mean		268	218	212	220
L. reuteri DS-33	1[c]	2	411	249	254	263
		9	311	208	195	230
		12	409	232	231	257
	Exp. 1 Mean		377	230	227	250
	2[d]	2	253	249	224	188
		8	166	208	175	114
		15	103	232	155	93
	Exp. 2 Mean		174	230	185	132
	Overall Mean		276	230	206	191
L. reuteri WB-74	1[c]	1	392	310	247	263
		10	440	319	290	336
		14	322	204	273	315
	Exp. 1 Mean		385	278	270	305
	2[d]	4	252	310	218	247
		5	197	319	151	161
		11	318	204	301	231
	Exp. 2 Mean		256	278	223	213
	Overall Mean		320	278	247	259
L. reuteri WB-75	1[c]	4	448	277	269	278
		7	297	185	178	207
		11	364	182	213	262
	Exp. 1 Mean		370	215	220	249
	2[d]	6	272	277	239	252
		9	308	185	225	199
		10	264	182	259	212
	Exp. 2 Mean		281	215	241	221
	Overall Mean		326	215	231	235
L. acidophilus L-23	1[c]	5	341	223	205	229
		6	412	250	238	289
		15	319	214	218	166
	Exp. 1 Mean		357	229	220	228
	2[d]	7	208	223	236	197
		12	250	250	158	152
		13	216	214	206	196
	Exp. 2 Mean		225	229	200	182
	Overall Mean		291	229	210	205

[a]ALKPhos - alkaline phosphatase

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B31. Study 1 weekly bili, total levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0[b]	Week 1[b]	Week 2[b]	Week 3[b]
Control	1[c]	3	0.2	0.1	0.1	0.2
		8	0.4	0.1	0.1	0.1
		13	0.3	0.3	0.1	0.1
	Exp. 1 Mean		0.3	0.2	0.1	0.1
	2[d]	1	0.1	0.1	0.1	0.2
		3	0.5	0.1	0.2	0.2
		14	0.2	0.3	0.1	0.1
	Exp. 2 Mean		0.3	0.2	0.1	0.2
	Overall Mean		0.3	0.2	0.1	0.2
L. reuteri DS-33	1[c]	2	0.4	0.2	0.3	0.2
		9	0.1	0.1	0.1	0.3
		12	0.3	0.1	0.2	0.2
	Exp. 1 Mean		0.3	0.1	0.2	0.2
	2[d]	2	0.1	0.2	0.1	0.2
		8	0.1	0.1	0.1	0.1
		15	0.1	0.1	0.3	0.1
	Exp. 2 Mean		0.1	0.1	0.2	0.1
	Overall Mean		0.2	0.1	0.2	0.2
L. reuteri WB-74	1[c]	1	0.2	0.1	0.2	0.2
		10	0.2	0.1	0.2	0.3
		14	0.1	0.1	0.1	0.1
	Exp. 1 Mean		0.2	0.1	0.2	0.2
	2[d]	4	0.2	0.1	0.1	0.1
		5	0.2	0.1	0.2	0.2
		11	0.4	0.1	0.1	0.1
	Exp. 2 Mean		0.3	0.1	0.1	0.1
	Overall Mean		0.2	0.1	0.2	0.2
L. reuteri WB-75	1[c]	4	0.1	0.3	0.1	0.3
		7	0.3	0.1	0.1	0.2
		11	0.2	0.2	0.3	0.1
	Exp. 1 Mean		0.2	0.2	0.2	0.2
	2[d]	6	0.1	0.3	0.1	0.3
		9	0.3	0.1	0.2	0.1
		10	0.1	0.2	0.1	0.1
	Exp. 2 Mean		0.2	0.2	0.1	0.2
	Overall Mean		0.2	0.2	0.2	0.2
L. acidophilus L-23	1[c]	5	0.2	0.2	0.2	0.3
		6	0.2	0.2	0.1	0.2
		15	0.2	0.2	0.2	0.1
	Exp. 1 Mean		0.2	0.2	0.2	0.2
	2[d]	7	0.1	0.2	0.2	0.1
		12	0.1	0.2	0.1	0.3
		13	0.2	0.2	0.1	0.4
	Exp. 2 Mean		0.1	0.2	0.1	0.3
	Overall Mean		0.2	0.2	0.2	0.2

[a]Description of treatments, experiments, and pigs - see Table B2

[b]All 0.1 individual pig values were equal to <0.1

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B32. Study 1 weekly cholesterol levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0[b]	Week 1[b]	Week 2[b]	Week 3[b]
Control	1[c]	3	50	50	69	65
		8	100	88	80	88
		13	55	74	64	70
	Exp. 1 Mean		68	71	71	74
	2[d]	1	70	50	88	95
		3	77	88	107	82
		14	77	74	82	83
	Exp. 2 Mean		75	71	92	87
	Overall Mean		72	71	82	81
L. reuteri DS-33	1[c]	2	63	55	62	71
		9	50	50	50	59
		12	69	65	76	82
	Exp. 1 Mean		60	57	63	71
	2[d]	2	51	55	72	97
		8	95	50	96	81
		15	53	65	66	50
	Exp. 2 Mean		66	57	78	76
	Overall Mean		64	57	70	73
L. reuteri WB-74	1[c]	1	50	50	50	51
		10	50	67	71	83
		14	50	59	50	60
	Exp. 1 Mean		50	59	57	65
	2[d]	4	67	50	92	101
		5	84	67	80	76
		11	73	59	81	72
	Exp. 2 Mean		75	59	84	83
	Overall Mean		62	59	71	74
L. reuteri WB-75	1[c]	4	50	59	65	81
		7	50	60	66	82
		11	73	80	83	104
	Exp. 1 Mean		58	66	71	89
	2[d]	6	62	59	79	84
		9	69	60	56	52
		10	100	80	116	82
	Exp. 2 Mean		77	66	84	73
	Overall Mean		67	66	78	81
L. acidophilus L-23	1[c]	5	76	67	74	89
		6	62	69	64	81
		15	51	59	64	79
	Exp. 1 Mean		63	65	67	83
	2[d]	7	67	67	88	85
		12	78	69	78	86
		13	82	59	78	109
	Exp. 2 Mean		76	65	81	93
	Overall Mean		69	65	74	88

[a]Description of treatments, experiments, and pigs - see Table B2

[b]All 50 individual pig values were equal to <50

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B33. Study 1 weekly triglyceride levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	3	27	19	26	15
		8	36	16	24	30
		13	25	31	25	26
	Exp. 1 Mean		29	22	25	24
	2[c]	1	32	19	45	28
		3	42	16	57	40
		14	56	31	38	42
	Exp. 2 Mean		43	22	47	37
	Overall Mean		36	22	36	30
L. reuteri DS-33	1[b]	2	30	21	38	21
		9	45	38	39	37
		12	23	20	28	24
	Exp. 1 Mean		33	26	35	27
	2[c]	2	24	21	41	44
		8	41	38	39	35
		15	25	20	27	15
	Exp. 2 Mean		30	26	36	31
	Overall Mean		31	26	35	29
L. reuteri WB-74	1[b]	1	35	25	24	23
		10	17	53	29	36
		14	26	23	15	52
	Exp. 1 Mean		22	34	23	37
	2[c]	4	38	25	29	36
		5	22	53	25	28
		11	76	23	46	31
	Exp. 2 Mean		45	34	33	32
	Overall Mean		36	34	28	34
L. reuteri WB-75	1[b]	4	23	17	21	19
		7	39	28	29	28
		11	25	36	31	36
	Exp. 1 Mean		29	27	27	28
	2[c]	6	54	17	24	41
		9	42	28	29	28
		10	40	36	84	68
	Exp. 2 Mean		45	27	46	46
	Overall Mean		37	27	36	37
L. acidophilus L-23	1[b]	5	32	19	22	31
		6	22	24	15	20
		15	25	19	24	25
	Exp. 1 Mean		26	21	20	25
	2[c]	7	40	19	49	44
		12	46	24	21	77
		13	54	19	27	79
	Exp. 2 Mean		47	21	32	67
	Overall Mean		37	21	26	46

[a]Description of treatments, experiments, and pigs - see Table B2

[b]Experiment 1 were barrows

[c]Experiment 2 were gilts

Table B34. Experiment 1 weekly HDL[a] levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	19	21	20	24
		8	38	33	28	33
		13	21	22	25	24
	Exp. 1 Mean		26	25	24	27
	2[d]	1	28	21	27	28
		3	24	33	33	25
		14	27	22	28	25
	Exp. 2 Mean		26	25	29	26
	Overall Mean		26	25	27	27
L. reuteri DS-33	1[c]	2	25	26	27	30
		9	20	16	17	25
		12	30	29	28	34
	Exp. 1 Mean		25	24	24	30
	2[d]	2	21	26	27	35
		8	30	16	30	28
		15	26	29	28	18
	Exp. 2 Mean		26	24	28	27
	Overall Mean		25	24	26	28
L. reuteri WB-74	1[c]	1	17	16	17	18
		10	17	22	24	30
		14	19	19	13	18
	Exp. 1 Mean		18	19	18	22
	2[d]	4	24	16	32	35
		5	35	22	30	22
		11	27	19	30	28
	Exp. 2 Mean		29	19	31	28
	Overall Mean		23	19	24	25
L. reuteri WB-75	1[c]	4	20	21	22	30
		7	21	28	28	34
		11	30	26	29	38
	Exp. 1 Mean		24	25	26	34
	2[d]	6	21	21	30	31
		9	23	28	20	19
		10	35	26	36	25
	Exp. 2 Mean		26	25	29	25
	Overall Mean		25	25	28	30
L. acidophilus L-23	1[c]	5	28	23	28	34
		6	25	26	23	31
		15	23	25	26	31
	Exp. 1 Mean		25	25	26	32
	2[d]	7	22	23	30	30
		12	27	26	26	30
		13	29	25	27	35
	Exp. 2 Mean		26	25	28	32
	Overall Mean		26	25	27	32

[a]HDL - high-density lipoprotein

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B35. Study 1 weekly VLDL[a] levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	5	4	5	3
		8	7	3	5	6
		13	5	6	5	5
	Exp. 1 Mean		6	4	5	5
	2[d]	1	6	4	9	6
		3	8	3	11	8
		14	11	6	8	8
	Exp. 2 Mean		8	4	9	7
	Overall Mean		7	4	7	6
L. reuteri DS-33	1[c]	2	7	4	8	4
		9	9	8	8	7
		12	5	4	6	5
	Exp. 1 Mean		7	5	7	5
	2[d]	2	5	4	8	9
		8	8	8	8	7
		15	5	4	5	3
	Exp. 2 Mean		6	5	7	6
	Overall Mean		7	5	7	6
L. reuteri WB-74	1[c]	1	7	5	5	5
		10	3	11	6	7
		14	5	5	3	10
	Exp. 1 Mean		5	7	5	7
	2[d]	4	8	5	6	7
		5	4	11	5	6
		11	15	5	9	6
	Exp. 2 Mean		9	7	7	6
	Overall Mean		7	7	6	7
L. reuteri WB-75	1[c]	4	5	3	4	4
		7	8	6	6	6
		11	5	7	6	7
	Exp. 1 Mean		6	5	5	6
	2[d]	6	11	3	5	8
		9	8	6	6	6
		10	8	7	17	14
	Exp. 2 Mean		9	5	9	9
	Overall Mean		8	5	7	8
L. acidophilus L-23	1[c]	5	6	4	4	6
		6	4	5	3	4
		15	5	4	5	5
	Exp. 1 Mean		5	4	4	5
	2[d]	7	8	4	10	9
		12	9	5	4	15
		13	11	4	5	16
	Exp. 2 Mean		9	4	6	13
	Overall Mean		7	4	5	9

[a]VLDL - very low-density lipoprotein

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B36. Study 1 weekly IgA[a] levels (mg/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	0.534	0.585	0.708	0.775
		8	0.324	0.374	0.373	0.313
		13	0.328	0.412	0.388	0.591
	Exp. 1 Mean		0.395	0.457	0.490	0.560
	2[d]	1	0.379	0.345	0.334	0.370
		3	0.481	0.358	0.317	0.358
		14	0.674	0.386	0.441	0.784
	Exp. 2 Mean		0.511	0.363	0.364	0.504
	Overall Mean		0.453	0.410	0.427	0.532
L. reuteri DS-33	1[c]	2	0.357	0.442	0.378	0.445
		9	0.345	0.343	0.349	0.442
		12	0.623	0.530	0.829	0.903
	Exp. 1 Mean		0.441	0.438	0.519	0.597
	2[d]	2	0.956	0.980	0.894	0.999
		8	0.812	0.800	0.725	0.502
		15	0.738	0.338	0.378	0.526
	Exp. 2 Mean		0.835	0.706	0.666	0.676
	Overall Mean		0.638	0.572	0.592	0.636
L. reuteri WB-74	1[c]	1	0.326	0.524	0.284	0.561
		10	0.552	0.685	0.585	0.534
		14	0.720	0.628	0.627	0.896
	Exp. 1 Mean		0.533	0.612	0.499	0.664
	2[d]	4	0.348	0.551	0.379	0.358
		5	0.373	0.579	1.353	0.619
		11	0.978	1.289	0.674	1.414
	Exp. 2 Mean		0.566	0.806	0.802	0.797
	Overall Mean		0.549	0.709	0.650	0.730
L. reuteri WB-75	1[c]	4	0.428	0.449	0.458	0.620
		7	0.716	0.870	0.680	0.955
		11	0.285	0.291	0.411	0.524
	Exp. 1 Mean		0.476	0.537	0.516	0.700
	2[d]	6	0.447	0.575	0.251	0.312
		9	0.367	0.346	0.323	0.250
		10	0.303	0.351	0.357	0.494
	Exp. 2 Mean		0.372	0.424	0.310	0.352
	Overall Mean		0.424	0.480	0.413	0.526
L. acidophilus L-23	1[c]	5	0.531	0.420	0.287	0.516
		6	0.347	0.468	0.450	0.532
		15	0.324	0.517	0.337	0.330
	Exp. 1 Mean		0.400	0.469	0.358	0.459
	2[d]	7	0.842	0.593	0.732	0.898
		12	0.213	0.257	0.326	0.248
		13	0.236	0.189	0.199	0.332
	Exp. 2 Mean		0.430	0.346	0.419	0.493
	Overall Mean		0.415	0.407	0.389	0.476

[a]IgA - immunoglobulin A

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B37. Study 1 weekly IgG[a] levels (mg/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	4.447	8.336	7.110	7.098
		8	4.255	7.552	6.267	4.553
		13	6.107	3.990	5.283	9.335
	Exp. 1 Mean		4.936	6.626	6.220	6.995
	2[d]	1	12.300	9.677	10.570	9.195
		3	8.888	7.760	9.989	12.260
		14	12.370	11.600	16.240	7.057
	Exp. 2 Mean		11.186	9.679	12.266	9.504
	Overall Mean		8.061	8.153	9.243	8.250
L. reuteri DS-33	1[c]	2	3.354	6.783	4.734	4.075
		9	6.687	5.692	6.274	5.112
		12	12.430	15.140	10.830	9.920
	Exp. 1 Mean		7.490	9.205	7.279	6.369
	2[d]	2	10.920	7.985	10.330	11.470
		8	15.480	14.230	12.940	13.720
		15	9.515	13.080	11.830	4.178
	Exp. 2 Mean		11.972	11.765	11.700	9.789
	Overall Mean		9.731	10.485	9.490	8.079
L. reuteri WB-74	1[c]	1	4.289	6.648	8.324	5.113
		10	4.528	8.136	6.692	5.970
		14	10.440	9.317	7.416	9.550
	Exp. 1 Mean		6.419	8.034	7.477	6.878
	2[d]	4	9.837	9.342	8.771	9.874
		5	5.927	7.914	8.738	10.640
		11	12.130	12.240	9.198	9.277
	Exp. 2 Mean		9.298	9.832	8.902	9.930
	Overall Mean		7.859	8.933	8.190	8.404
L. reuteri WB-75	1[c]	4	3.733	8.142	11.890	7.555
		7	3.925	10.610	7.406	6.725
		11	6.373	5.591	5.974	5.317
	Exp. 1 Mean		4.677	8.114	8.423	6.532
	2[d]	6	11.410	10.650	12.320	14.080
		9	9.292	9.231	10.800	8.451
		10	10.020	7.416	7.549	7.629
	Exp. 2 Mean		10.241	9.099	10.223	10.053
	Overall Mean		7.459	8.607	9.323	8.293
L. acidophilus L-23	1[c]	5	3.141	8.967	7.679	8.947
		6	8.110	9.651	6.711	6.532
		15	5.907	9.068	7.339	9.013
	Exp. 1 Mean		5.719	9.229	7.243	8.164
	2[d]	7	10.460	9.412	8.522	12.690
		12	6.832	6.062	8.399	6.234
		13	10.420	13.210	12.780	16.300
	Exp. 2 Mean		9.237	9.561	9.900	11.741
	Overall Mean		7.478	9.395	8.572	9.953

[a]IgG - immunoglobulin G

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B38. Study 1 weekly IgM[a] levels (mg/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	3	0.990	1.296	1.313	1.756
		8	1.292	1.394	0.958	1.463
		13	1.172	0.963	0.907	1.434
	Exp. 1 Mean		1.151	1.218	1.059	1.551
	2[d]	1	1.588	1.741	2.053	1.808
		3	3.237	2.908	2.696	2.513
		14	5.528	5.776	5.604	4.837
	Exp. 2 Mean		3.451	3.475	3.451	3.053
	Overall Mean		2.301	2.346	2.255	2.302
L. reuteri DS-33	1[c]	2	1.813	1.312	1.242	1.072
		9	1.044	1.065	1.272	1.452
		12	1.953	1.516	1.143	1.544
	Exp. 1 Mean		1.603	1.298	1.219	1.356
	2[d]	2	4.073	2.859	2.303	2.348
		8	4.248	2.570	2.333	2.298
		15	3.905	2.617	2.426	2.242
	Exp. 2 Mean		4.075	2.682	2.354	2.296
	Overall Mean		2.839	1.990	1.787	1.826
L. reuteri WB-74	1[c]	1	1.039	1.562	1.235	0.856
		10	0.779	0.851	1.559	1.808
		14	1.986	2.968	1.523	2.044
	Exp. 1 Mean		1.268	1.794	1.439	1.569
	2[d]	4	1.996	1.879	2.411	2.710
		5	1.522	2.249	2.025	2.552
		11	4.461	3.263	3.016	2.749
	Exp. 2 Mean		2.660	2.464	2.484	2.670
	Overall Mean		1.964	2.129	1.962	2.120
L. reuteri WB-75	1[c]	4	1.459	1.683	1.312	1.645
		7	2.037	1.255	1.156	1.643
		11	1.196	0.993	0.921	1.786
	Exp. 1 Mean		1.564	1.310	1.130	1.691
	2[d]	6	2.386	2.838	2.828	2.954
		9	3.821	2.152	2.342	2.085
		10	3.046	3.677	2.863	3.380
	Exp. 2 Mean		3.084	2.889	2.678	2.806
	Overall Mean		2.324	2.100	1.904	2.249
L. acidophilus L-23	1[c]	5	1.607	1.859	1.165	2.073
		6	1.872	1.395	1.285	1.621
		15	1.220	0.973	0.849	1.279
	Exp. 1 Mean		1.566	1.409	1.100	1.658
	2[d]	7	2.507	1.738	1.609	1.746
		12	3.232	1.947	2.749	3.222
		13	2.036	1.711	1.652	2.585
	Exp. 2 Mean		2.592	1.799	2.003	2.518
	Overall Mean		2.079	1.604	1.552	2.088

[a]IgM - immunoglobulin M

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B39. Study 1 overall LPS[a] challenge feed intake (kg)

Treatment[b]	Exp.[b]	Pig[b]	FI[c]
Control	1[d]	3	0.73
		8	0.75
		13	0.84
	Exp. 1 Mean		0.77
	2[e]	1	0.89
		3	0.85
		14	0.88
	Exp. 2 Mean		0.88
	Overall Mean		0.82
L. reuteri DS-33	1[d]	2	0.24
		9	0.62
		12	0.71
	Exp. 1 Mean		0.52
	2[e]	2	0.43
		8	0.90
		15	0.83
	Exp. 2 Mean		0.72
	Overall Mean		0.62
L. reuteri WB-74	1[d]	1	0.47
		10	0.01
		14	0.76
	Exp. 1 Mean		0.41
	2[e]	4	0.72
		5	0.79
		11	0.90
	Exp. 2 Mean		0.81
	Overall Mean		0.61
L. reuteri WB-75	1[d]	4	0.38
		7	0.47
		11	0.77
	Exp. 1 Mean		0.54
	2[e]	6	0.75
		9	0.82
		10	0.85
	Exp. 2 Mean		0.81
	Overall Mean		0.67
L. acidophilus L-23	1[d]	5	0.31
		6	0.58
		15	0.67
	Exp. 1 Mean		0.52
	2[e]	7	0.80
		12	0.75
		13	0.85
	Exp. 2 Mean		0.80
	Overall Mean		0.66

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]FI - feed intake

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B40. Study 1 LPS[a] challenge swine weights (kg)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	24.58	24.13	23.68	24.31
		8	20.68	20.28	19.96	21.68
		13	20.23	19.87	20.18	21.64
	Exp. 1 Mean		21.83	21.42	21.27	22.54
	2[d]	1	24.63	23.77	23.95	24.58
		3	21.50	20.87	20.23	21.32
		14	19.28	18.78	18.42	19.46
	Exp. 2 Mean		21.80	21.14	20.87	21.79
	Overall Mean		21.82	21.28	21.07	22.17
L. reuteri DS-33	1[c]	2	26.67	25.67	25.13	25.40
		9	21.41	21.23	20.77	21.77
		12	26.49	25.40	25.13	26.31
	Exp. 1 Mean		24.86	24.10	23.68	24.49
	2[d]	2	24.40	23.95	23.22	23.50
		8	22.41	21.59	21.41	22.59
		15	18.73	18.33	17.60	19.14
	Exp. 2 Mean		21.85	21.29	20.74	21.74
	Overall Mean		23.35	22.69	22.21	23.12
L. reuteri WB-74	1[c]	1	24.68	25.49	25.08	25.31
		10	25.04	24.77	23.90	23.68
		14	18.51	18.01	17.69	18.82
	Exp. 1 Mean		22.74	22.76	22.23	22.60
	2[d]	4	22.00	21.14	21.05	22.04
		5	20.87	20.59	20.00	21.23
		11	21.05	20.46	19.60	20.68
	Exp. 2 Mean		21.30	20.73	20.22	21.32
	Overall Mean		22.02	21.74	21.22	21.96
L. reuteri WB-75	1[c]	4	24.58	24.13	23.72	23.59
		7	22.23	21.86	21.77	22.59
		11	22.86	22.50	21.95	23.86
	Exp. 1 Mean		23.22	22.83	22.48	23.34
	2[d]	6	19.64	19.23	18.82	20.23
		9	20.68	20.32	20.05	21.32
		10	22.14	21.77	21.41	22.41
	Exp. 2 Mean		20.82	20.44	20.09	21.32
	Overall Mean		22.02	21.64	21.29	22.33
L. acidophilus L-23	1[c]	5	27.31	26.94	26.40	26.72
		6	22.95	22.32	22.04	22.95
		15	21.32	20.68	20.09	21.50
	Exp. 1 Mean		23.86	23.31	22.85	23.72
	2[d]	7	21.86	21.23	21.59	22.23
		12	19.14	18.33	18.23	18.73
		13	25.04	24.58	23.77	25.08
	Exp. 2 Mean		22.01	21.38	21.20	22.01
	Overall Mean		22.94	22.35	22.02	22.87

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B41. Study 1 hourly LPS[a] challenge rectal temperatures (℃)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	39.63	39.41	40.18	39.63	39.68	39.46
		8	39.07	39.41	39.74	39.90	39.18	39.46
		13	38.91	39.18	40.24	40.40	39.74	39.18
	Exp. 1 Mean		39.20	39.33	40.05	39.98	39.53	39.37
	2[d]	1	39.79	40.13	40.63	40.13	39.68	39.79
		3	39.41	39.07	40.24	39.46	39.68	39.18
		14	39.52	40.13	40.35	40.40	40.02	39.46
	Exp. 2 Mean		39.57	39.78	40.40	40.00	39.79	39.48
	Overall Mean		39.39	39.55	40.23	39.99	39.66	39.42
L. reuteri DS-33	1[c]	2	39.02	39.57	40.35	40.63	40.68	39.96
		9	38.85	39.35	40.40	39.90	39.90	39.07
		12	39.35	39.63	41.18	40.46	39.24	39.35
	Exp. 1 Mean		39.07	39.52	40.64	40.33	39.94	39.46
	2[d]	2	39.52	39.85	40.90	40.52	40.96	40.29
		8	39.63	39.79	40.68	39.63	39.68	39.29
		15	39.68	39.57	40.07	40.29	39.68	39.18
	Exp. 2 Mean		39.61	39.74	40.55	40.15	40.11	39.59
	Overall Mean		39.34	39.63	40.60	40.24	40.02	39.53
L. reuteri WB-74	1[c]	1	39.29	39.35	39.90	40.40	39.90	41.24
		10	39.41	39.46	40.35	40.35	41.24	39.02
		14	39.35	39.13	40.40	40.07	39.79	39.90
	Exp. 1 Mean		39.35	39.31	40.22	40.27	40.31	40.05
	2[d]	4	39.57	40.13	40.79	39.79	40.13	39.68
		5	39.57	40.90	41.01	39.57	39.63	39.24
		11	39.18	39.85	40.57	39.63	40.18	39.35
	Exp. 2 Mean		39.44	40.29	40.79	39.66	39.98	39.42
	Overall Mean		39.40	39.80	40.51	39.97	40.15	39.74
L. reuteri WB-75	1[c]	4	39.35	39.13	39.96	39.79	39.41	39.74
		7	39.57	39.46	40.57	40.29	40.02	39.41
		11	39.68	39.35	39.96	40.13	39.85	39.52
	Exp. 1 Mean		39.53	39.31	40.16	40.07	39.76	39.55
	2[d]	6	39.35	39.18	39.57	39.41	39.35	39.24
		9	39.46	39.68	40.29	40.68	39.46	39.41
		10	39.57	40.74	40.90	39.85	40.02	39.79
	Exp. 2 Mean		39.46	39.87	40.26	39.98	39.61	39.48
	Overall Mean		39.50	39.59	40.21	40.02	39.68	39.52
L. acidophilus L-23	1[c]	5	39.13	39.18	40.18	40.63	40.07	39.96
		6	39.35	39.52	40.40	40.57	40.07	39.57
		15	39.07	39.02	40.57	40.96	40.46	39.85
	Exp. 1 Mean		39.18	39.24	40.39	40.72	40.20	39.79
	2[d]	7	39.63	39.41	40.46	40.74	39.46	39.07
		12	39.85	40.13	41.07	40.46	40.02	39.29
		13	39.18	39.29	40.29	39.41	39.52	39.46
	Exp. 2 Mean		39.55	39.61	40.61	40.20	39.66	39.28
	Overall Mean		39.37	39.42	40.50	40.46	39.93	39.53

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B42. Study 1 hourly LPS[a] challenge glucose levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	123	123	103	80	71	125
		8	120	100	89	78	55	86
		13	113	116	121	117	115	115
	Exp. 1 Mean		119	113	104	92	80	109
	2[d]	1	133	115	115	103	81	125
		3	140	103	78	99	74	101
		14	116	90	85	110	73	114
	Exp. 2 Mean		130	103	93	104	76	113
	Overall Mean		124	108	99	98	78	111
L. reuteri DS-33	1[c]	2	130	126	111	64	102	139
		9	142	127	145	106	72	127
		12	124	116	93	47	70	90
	Exp. 1 Mean		132	123	116	72	81	119
	2[d]	2	122	128	74	96	79	120
		8	106	113	93	105	103	106
		15	104	101	85	109	99	109
	Exp. 2 Mean		111	114	84	103	94	112
	Overall Mean		121	119	100	88	88	115
L. reuteri WB-74	1[c]	1	113	116	150	84	74	128
		10	133	134	97	75	70	99
		14	90	89	80	58	56	105
	Exp. 1 Mean		112	113	109	72	67	111
	2[d]	4	152	138	76	96	80	107
		5	136	120	76	98	88	96
		11	128	118	98	96	80	142
	Exp. 2 Mean		139	125	83	97	83	115
	Overall Mean		125	119	96	85	75	113
L. reuteri WB-75	1[c]	4	128	129	123	73	79	124
		7	121	119	121	70	62	124
		11	118	106	94	49	52	111
	Exp. 1 Mean		122	118	113	64	64	120
	2[d]	6	111	78	88	102	76	113
		9	127	123	94	103	90	107
		10	145	120	91	114	110	121
	Exp. 2 Mean		128	107	91	106	92	114
	Overall Mean		125	113	102	85	78	117
L. acidophilus L-23	1[c]	5	118	119	123	46	83	114
		6	115	123	126	72	64	133
		15	125	110	118	93	72	93
	Exp. 1 Mean		119	117	122	70	73	113
	2[d]	7	131	92	91	116	62	113
		12	140	106	82	98	103	113
		13	176	117	77	108	71	100
	Exp. 2 Mean		149	105	83	107	79	109
	Overall Mean		134	111	103	89	76	111

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B43. Study 1 hourly LPS[a] challenge BUN[b] levels (mg/dL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	9	8	7	8	12	11
		8	7	7	7	9	11	11
		13	8	8	8	7	8	10
	Exp. 1 Mean		8	8	7	8	10	11
	2[e]	1	7	7	7	7	11	11
		3	8	8	6	7	9	12
		14	10	9	8	10	10	10
	Exp. 2 Mean		8	8	7	8	10	11
	Overall Mean		8	8	7	8	10	11
L. reuteri DS-33	1[d]	2	9	9	8	10	17	12
		9	9	9	11	11	14	12
		12	9	8	7	11	15	13
	Exp. 1 Mean		9	9	9	11	15	12
	2[e]	2	9	9	7	9	13	16
		8	9	10	9	9	8	7
		15	9	9	8	10	8	8
	Exp. 2 Mean		9	9	8	9	10	10
	Overall Mean		9	9	8	10	13	11
L. reuteri WB-74	1[d]	1	8	7	9	9	11	9
		10	7	7	7	10	13	13
		14	12	12	12	14	14	11
	Exp. 1 Mean		9	9	9	11	13	11
	2[e]	4	14	15	10	11	11	12
		5	8	8	7	8	7	7
		11	9	9	9	10	14	12
	Exp. 2 Mean		10	11	9	10	11	10
	Overall Mean		10	10	9	10	12	11
L. reuteri WB-75	1[d]	4	8	9	9	11	16	13
		7	7	6	8	8	9	8
		11	6	6	8	12	14	10
	Exp. 1 Mean		7	7	8	10	13	10
	2[e]	6	11	9	9	9	9	13
		9	8	8	8	9	9	9
		10	7	7	6	8	7	7
	Exp. 2 Mean		9	8	8	9	8	10
	Overall Mean		8	8	8	10	11	10
L. acidophilus L-23	1[d]	5	11	11	12	15	19	16
		6	6	6	7	9	14	12
		15	5	5	6	8	11	10
	Exp. 1 Mean		7	7	8	11	15	13
	2[e]	7	9	8	8	9	11	12
		12	10	9	9	10	9	8
		13	10	9	8	9	12	11
	Exp. 2 Mean		10	9	8	9	11	10
	Overall Mean		9	8	8	10	13	12

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]BUN - blood urea nitrogen

[b]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B44. Study 1 hourly LPS[a] challenge creatinine levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	1.0	1.0	0.9	1.0	1.4	1.2
		8	1.0	1.0	1.0	1.2	1.3	1.0
		13	1.1	1.1	1.1	1.2	1.5	1.2
	Exp. 1 Mean		1.0	1.0	1.0	1.1	1.4	1.1
	2[d]	1	1.1	1.0	1.2	1.2	1.4	1.2
		3	1.0	1.0	1.1	1.0	1.2	1.2
		14	1.1	0.9	0.8	1.2	1.4	1.2
	Exp. 2 Mean		1.1	1.0	1.0	1.1	1.3	1.2
	Overall Mean		1.1	1.0	1.0	1.1	1.4	1.2
L. reuteri DS-33	1[c]	2	1.1	1.1	1.2	1.3	1.6	1.6
		9	1.0	1.0	1.2	1.1	1.3	1.2
		12	0.9	0.9	0.8	1.2	1.3	1.0
	Exp. 1 Mean		1.0	1.0	1.1	1.2	1.4	1.3
	2[d]	2	1.3	1.3	0.8	1.2	1.6	1.7
		8	1.0	1.1	1.1	1.3	1.2	1.1
		15	0.9	0.9	0.8	1.2	1.1	1.0
	Exp. 2 Mean		1.1	1.1	0.9	1.2	1.3	1.3
	Overall Mean		1.0	1.1	1.0	1.2	1.4	1.3
L. reuteri WB-74	1[c]	1	0.9	1.0	1.3	1.0	1.4	1.1
		10	1.0	1.0	0.9	1.3	1.3	1.3
		14	1.0	1.0	1.0	1.1	1.4	1.0
	Exp. 1 Mean		1.0	1.0	1.1	1.1	1.4	1.1
	2[d]	4	1.7	1.6	0.9	1.5	1.5	1.4
		5	1.2	1.2	1.0	1.1	1.1	1.1
		11	1.1	1.1	1.0	1.3	1.6	1.2
	Exp. 2 Mean		1.3	1.3	1.0	1.3	1.4	1.2
	Overall Mean		1.2	1.2	1.0	1.2	1.4	1.2
L. reuteri WB-75	1[c]	4	1.1	1.1	1.1	1.1	1.3	1.5
		7	1.1	1.1	1.3	1.3	1.5	1.1
		11	1.0	1.0	1.2	1.2	1.5	1.0
	Exp. 1 Mean		1.1	1.1	1.2	1.2	1.4	1.2
	2[d]	6	1.2	1.0	1.0	1.2	1.3	1.3
		9	1.2	1.3	1.0	1.2	1.4	1.3
		10	1.2	1.2	1.0	1.3	1.4	1.2
	Exp. 2 Mean		1.2	1.2	1.0	1.2	1.4	1.3
	Overall Mean		1.1	1.1	1.1	1.2	1.4	1.2
L. acidophilus L-23	1[c]	5	1.1	1.2	1.3	1.4	1.5	1.2
		6	1.0	1.1	1.1	1.2	1.6	1.2
		15	0.9	0.9	1.0	1.2	1.3	1.0
	Exp. 1 Mean		1.0	1.1	1.1	1.3	1.5	1.1
	2[d]	7	1.2	1.0	1.0	1.2	1.4	1.3
		12	1.4	1.2	1.1	1.4	1.5	1.1
		13	1.4	1.1	1.0	1.4	1.5	1.3
	Exp. 2 Mean		1.3	1.1	1.0	1.3	1.5	1.2
	Overall Mean		1.2	1.1	1.1	1.3	1.5	1.2

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B45. Study 1 hourly LPS[a] challenge BUN[b]:creatinine ratio levels

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	8.6	8.8	8.0	8.0	8.6	9.1
		8	6.4	6.6	7.1	7.7	8.4	11.3
		13	7.4	6.9	6.9	6.1	5.0	8.6
	Exp. 1 Mean		7.5	7.4	7.3	7.3	7.3	9.7
	2[e]	1	6.3	6.7	5.5	5.5	8.0	8.8
		3	8.1	8.3	7.3	6.9	7.1	9.6
		14	8.9	10.3	9.3	8.1	7.1	8.6
	Exp. 2 Mean		7.8	8.4	7.4	6.8	7.4	9.0
	Overall Mean		7.6	7.9	7.4	7.1	7.4	9.3
L. reuteri DS-33	1[d]	2	8.3	7.9	7.2	8.2	10.7	7.2
		9	8.7	9.1	9.1	10.0	10.2	10.4
		12	9.7	9.0	8.9	9.7	11.3	12.5
	Exp. 1 Mean		8.9	8.7	8.4	9.3	10.7	10.0
	2[e]	2	6.6	7.1	7.7	7.3	8.1	9.5
		8	8.8	9.4	8.8	7.3	6.6	6.7
		15	10.0	10.1	10.5	7.8	7.7	8.0
	Exp. 2 Mean		8.5	8.9	9.0	7.5	7.5	8.1
	Overall Mean		8.7	8.8	8.7	8.4	9.1	9.1
L. reuteri WB-74	1[d]	1	8.8	7.7	7.2	8.8	7.7	7.9
		10	6.8	7.0	7.7	7.7	10.4	10.3
		14	12.0	12.0	12.1	12.5	10.4	10.5
	Exp. 1 Mean		9.2	8.9	9.0	9.7	9.5	9.6
	2[e]	4	8.4	9.0	9.1	7.4	7.3	8.8
		5	6.2	7.1	7.3	7.2	6.6	7.0
		11	7.8	8.5	8.5	7.6	8.5	9.8
	Exp. 2 Mean		7.5	8.2	8.3	7.4	7.5	8.5
	Overall Mean		8.3	8.6	8.7	8.5	8.5	9.1
L. reuteri WB-75	1[d]	4	7.2	7.7	8.0	9.5	12.0	9.1
		7	6.0	5.9	6.0	6.0	6.2	7.4
		11	5.7	6.1	6.9	10.1	9.5	10.1
	Exp. 1 Mean		6.3	6.6	7.0	8.5	9.2	8.9
	2[e]	6	8.9	9.2	9.1	7.8	7.2	10.3
		9	6.6	6.7	7.5	7.0	6.5	7.3
		10	5.8	6.2	6.6	5.8	5.3	5.7
	Exp. 2 Mean		7.1	7.4	7.7	6.9	6.3	7.8
	Overall Mean		6.7	7.0	7.4	7.7	7.8	8.3
L. acidophilus L-23	1[d]	5	9.7	9.2	9.4	10.5	13.1	12.9
		6	5.4	5.8	6.6	8.0	8.8	10.1
		15	5.6	5.6	5.6	6.6	8.1	10.3
	Exp. 1 Mean		6.9	6.9	7.2	8.4	10.0	11.1
	2[e]	7	7.1	8.5	8.0	7.8	7.9	9.9
		12	7.0	7.8	8.2	7.2	5.7	7.1
		13	6.7	8.5	8.3	6.8	7.6	8.5
	Exp. 2 Mean		6.9	8.3	8.2	7.3	7.1	8.5
	Overall Mean		6.9	7.6	7.7	7.8	8.5	9.8

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]BUN - blood urea nitrogen

[c]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B46. Study 1 hourly LPS[a] challenge sodium levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	144	141	136	141	139	146
		8	143	141	137	139	129	130
		13	145	142	146	143	143	138
	Exp. 1 Mean		144	141	140	141	137	138
	2[d]	1	147	135	143	142	143	146
		3	136	131	111	138	140	144
		14	137	117	105	140	140	143
	Exp. 2 Mean		140	128	120	140	141	144
	Overall Mean		142	135	130	141	139	141
L. reuteri DS-33	1[c]	2	145	143	140	143	141	150
		9	141	138	156	141	134	144
		12	142	139	128	141	136	134
	Exp. 1 Mean		143	140	141	142	137	143
	2[d]	2	154	149	105	139	140	144
		8	129	132	125	140	141	144
		15	125	126	110	140	140	141
	Exp. 2 Mean		136	136	113	140	140	143
	Overall Mean		139	138	127	141	139	143
L. reuteri WB-74	1[c]	1	143	142	168	141	139	141
		10	150	141	129	142	131	136
		14	144	140	136	141	134	134
	Exp. 1 Mean		146	141	144	141	135	137
	2[d]	4	152	151	106	139	141	142
		5	149	142	117	140	140	145
		11	139	130	120	141	143	143
	Exp. 2 Mean		147	141	114	140	141	143
	Overall Mean		146	141	129	141	138	140
L. reuteri WB-75	1[c]	4	146	144	146	142	140	152
		7	145	143	155	140	139	145
		11	143	139	157	139	135	137
	Exp. 1 Mean		145	142	153	140	138	145
	2[d]	6	148	122	129	141	143	144
		9	143	141	126	140	143	146
		10	144	137	116	142	144	147
	Exp. 2 Mean		145	133	124	141	143	146
	Overall Mean		145	138	138	141	141	145
L. acidophilus L-23	1[c]	5	143	144	153	142	140	140
		6	144	141	146	139	144	145
		15	142	139	145	144	136	134
	Exp. 1 Mean		143	141	148	142	140	140
	2[d]	7	146	129	127	144	146	145
		12	142	130	124	142	143	143
		13	149	125	113	142	142	145
	Exp. 2 Mean		146	128	121	143	144	144
	Overall Mean		144	135	135	142	142	142

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B47. Study 1 hourly LPS[a] challenge potassium levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	12.3	11.4	9.8	9.6	8.1	10.3
		8	10.8	10.2	11.4	10.0	8.8	9.8
		13	10.4	9.6	9.9	9.1	8.2	8.8
	Exp. 1 Mean		11.2	10.4	10.4	9.6	8.4	9.6
	2[d]	1	10.0	9.2	9.5	10.1	9.2	9.8
		3	9.9	8.9	7.3	9.8	9.6	9.5
		14	9.6	8.4	8.5	8.9	8.5	8.9
	Exp. 2 Mean		9.8	8.8	8.4	9.6	9.1	9.4
	Overall Mean		10.5	9.6	9.4	9.6	8.7	9.5
L. reuteri DS-33	1[c]	2	10.4	10.2	9.7	9.1	7.6	10.2
		9	11.7	9.9	10.0	9.0	7.5	9.3
		12	9.3	8.3	8.3	8.6	7.3	7.8
	Exp. 1 Mean		10.5	9.5	9.3	8.9	7.5	9.1
	2[d]	2	10.2	10.2	7.2	9.0	9.7	7.9
		8	8.1	8.9	8.2	7.8	8.5	8.3
		15	8.8	8.4	7.6	9.0	9.2	8.3
	Exp. 2 Mean		9.0	9.2	7.7	8.6	9.1	8.2
	Overall Mean		9.8	9.3	8.5	8.8	8.3	8.6
L. reuteri WB-74	1[c]	1	11.0	10.4	11.1	9.8	8.5	9.8
		10	13.0	10.7	9.9	10.0	9.0	9.1
		14	10.5	9.6	8.6	9.0	7.2	8.9
	Exp. 1 Mean		11.5	10.2	9.9	9.6	8.2	9.3
	2[d]	4	10.0	9.1	8.1	8.4	8.9	8.0
		5	9.7	8.6	7.9	8.6	8.4	8.3
		11	9.9	8.5	8.2	9.2	9.5	8.2
	Exp. 2 Mean		9.9	8.7	8.1	8.7	8.9	8.2
	Overall Mean		10.7	9.5	9.0	9.2	8.6	8.7
L. reuteri WB-75	1[c]	4	10.8	9.5	9.9	9.4	8.0	9.5
		7	11.5	11.2	11.5	10.7	8.3	9.4
		11	9.6	9.0	10.1	10.5	7.4	8.7
	Exp. 1 Mean		10.6	9.9	10.5	10.2	7.9	9.2
	2[d]	6	10.5	8.1	8.8	8.4	9.2	8.3
		9	9.1	9.1	8.6	9.3	9.4	9.2
		10	10.2	9.9	8.6	9.7	11.0	10.1
	Exp. 2 Mean		9.9	9.0	8.7	9.1	9.9	9.2
	Overall Mean		10.3	9.5	9.6	9.7	8.9	9.2
L. acidophilus L-23	1[c]	5	10.6	9.9	9.7	9.3	8.1	9.1
		6	10.9	9.9	9.7	9.8	8.7	9.0
		15	10.0	9.8	9.7	9.9	7.7	8.5
	Exp. 1 Mean		10.5	9.9	9.7	9.7	8.2	8.9
	2[d]	7	10.4	8.8	9.2	9.5	9.8	9.2
		12	9.0	8.9	9.9	10.0	9.9	8.3
		13	10.9	8.6	8.6	9.7	8.7	8.7
	Exp. 2 Mean		10.1	8.8	9.2	9.7	9.5	8.7
	Overall Mean		10.3	9.3	9.5	9.7	8.8	8.8

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B48. Study 1 hourly LPS[a] challenge chloride levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	106	106	101	102	103	112
		8	107	105	105	103	99	101
		13	107	106	109	104	105	103
	Exp. 1 Mean		107	106	105	103	102	105
	2[d]	1	110	104	105	104	105	110
		3	104	99	84	103	104	109
		14	102	90	79	100	100	106
	Exp. 2 Mean		105	98	89	102	103	108
	Overall Mean		106	102	97	103	103	107
L. reuteri DS-33	1[c]	2	106	104	107	103	102	112
		9	109	105	113	103	100	110
		12	104	102	96	102	102	103
	Exp. 1 Mean		106	104	105	103	101	108
	2[d]	2	111	109	78	103	105	104
		8	96	97	92	100	104	107
		15	97	95	84	102	105	104
	Exp. 2 Mean		101	100	85	102	105	105
	Overall Mean		104	102	95	102	103	107
L. reuteri WB-74	1[c]	1	103	101	116	101	101	110
		10	109	103	97	103	102	106
		14	103	101	99	102	99	105
	Exp. 1 Mean		105	102	104	102	101	107
	2[d]	4	111	111	80	100	103	107
		5	113	106	88	104	105	109
		11	106	98	88	103	103	107
	Exp. 2 Mean		110	105	85	102	104	108
	Overall Mean		108	103	95	102	102	107
L. reuteri WB-75	1[c]	4	105	104	106	102	102	111
		7	109	110	115	108	103	109
		11	104	102	113	104	99	109
	Exp. 1 Mean		106	105	111	105	101	110
	2[d]	6	109	93	99	102	103	106
		9	104	102	94	103	104	111
		10	105	102	86	102	105	108
	Exp. 2 Mean		106	99	93	102	104	108
	Overall Mean		106	102	102	104	103	109
L. acidophilus L-23	1[c]	5	105	105	112	103	103	106
		6	107	104	108	104	102	108
		15	107	105	106	103	98	102
	Exp. 1 Mean		106	105	109	103	101	105
	2[d]	7	108	97	96	103	104	110
		12	106	98	93	102	102	108
		13	112	95	86	101	102	105
	Exp. 2 Mean		109	97	92	102	103	108
	Overall Mean		108	101	100	103	102	107

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B49. Study 1 hourly LPS[a] challenge carbon dioxide levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	23	26	26	29	27	26
		8	20	25	24	29	22	22
		13	21	25	23	23	23	23
	Exp. 1 Mean		21	25	24	27	24	24
	2[d]	1	24	23	27	27	25	24
		3	20	22	21	23	26	27
		14	23	21	20	31	30	28
	Exp. 2 Mean		22	22	23	27	27	26
	Overall Mean		22	24	24	27	26	25
L. reuteri DS-33	1[c]	2	24	26	22	28	26	21
		9	16	25	30	29	25	20
		12	24	27	23	26	24	21
	Exp. 1 Mean		21	26	25	28	25	21
	2[d]	2	29	29	20	26	26	29
		8	23	25	26	28	24	26
		15	21	25	23	27	26	27
	Exp. 2 Mean		24	26	23	27	25	27
	Overall Mean		23	26	24	27	25	24
L. reuteri WB-74	1[c]	1	27	28	37	29	27	18
		10	21	27	22	27	20	20
		14	25	30	22	30	26	23
	Exp. 1 Mean		24	28	27	29	24	20
	2[d]	4	24	27	18	28	26	24
		5	18	23	23	27	25	27
		11	17	21	25	28	24	24
	Exp. 2 Mean		20	24	22	28	25	25
	Overall Mean		22	26	25	28	25	23
L. reuteri WB-75	1[c]	4	21	29	29	30	26	24
		7	19	19	27	20	23	20
		11	21	26	30	20	24	16
	Exp. 1 Mean		20	25	29	23	24	20
	2[d]	6	27	23	26	30	29	28
		9	23	24	27	26	30	22
		10	21	21	22	28	24	24
	Exp. 2 Mean		24	23	25	28	28	25
	Overall Mean		22	24	27	26	26	22
L. acidophilus L-23	1[c]	5	22	25	29	27	24	23
		6	21	25	28	24	27	23
		15	19	24	27	23	26	24
	Exp. 1 Mean		21	25	28	25	26	23
	2[d]	7	24	23	24	26	25	24
		12	18	19	21	28	24	22
		13	15	17	19	26	26	25
	Exp. 2 Mean		19	20	21	27	25	24
	Overall Mean		20	22	25	26	25	24

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B50. Study 1 hourly LPS[a] challenge anion gap levels

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	27.4	20.6	18.7	18.9	17.6	18.6
		8	26.0	21.1	20.0	16.8	17.2	17.3
		13	26.8	21.1	23.3	25.3	23.7	20.6
	Exp. 1 Mean		26.7	20.9	20.7	20.3	19.5	18.8
	2[d]	1	24.1	17.8	20.6	21.3	22.2	22.2
		3	22.3	18.5	13.0	21.2	19.6	17.8
		14	21.3	14.7	14.2	17.4	18.9	18.6
	Exp. 2 Mean		22.6	17.0	15.9	20.0	20.2	19.5
	Overall Mean		24.7	19.0	18.3	20.2	19.9	19.2
L. reuteri DS-33	1[c]	2	25.8	23.3	21.6	21.3	21.2	26.8
		9	27.4	18.0	23.3	18.2	16.2	24.0
		12	22.6	18.9	17.0	21.5	17.4	17.0
	Exp. 1 Mean		25.3	20.1	20.6	20.3	18.3	22.6
	2[d]	2	24.7	21.4	14.3	18.8	18.4	19.2
		8	18.1	19.2	15.3	19.5	21.4	19.4
		15	16.1	14.6	11.3	19.6	17.8	18.0
	Exp. 2 Mean		19.6	18.4	13.6	19.3	19.2	18.9
	Overall Mean		22.5	19.2	17.1	19.8	18.7	20.7
L. reuteri WB-74	1[c]	1	23.9	23.6	25.6	20.2	19.3	22.6
		10	32.4	21.7	20.2	22.0	18.3	19.1
		14	25.9	18.7	22.9	17.7	16.6	15.4
	Exp. 1 Mean		27.4	21.3	22.9	20.0	18.1	19.0
	2[d]	4	27.6	22.4	16.6	19.0	20.4	19.5
		5	27.2	21.3	14.4	17.8	18.0	17.8
		11	26.6	19.9	14.7	19.0	25.3	21.3
	Exp. 2 Mean		27.1	21.2	15.2	18.6	21.2	19.5
	Overall Mean		27.3	21.3	19.1	19.3	19.7	19.3
L. reuteri WB-75	1[c]	4	30.5	20.9	21.2	19.6	19.6	26.8
		7	28.7	24.6	24.0	21.4	21.1	25.0
		11	27.9	20.7	24.0	26.1	20.1	21.2
	Exp. 1 Mean		29.0	22.1	23.1	22.4	20.3	24.3
	2[d]	6	21.9	13.9	13.7	17.5	20.4	18.2
		9	25.7	24.0	14.6	20.2	18.9	21.6
		10	27.8	24.0	16.1	21.4	25.4	24.5
	Exp. 2 Mean		25.1	20.6	14.8	19.7	21.6	21.4
	Overall Mean		27.1	21.4	18.9	21.0	20.9	22.9
L. acidophilus L-23	1[c]	5	26.6	23.4	22.4	21.9	21.3	20.6
		6	27.6	22.5	19.9	21.2	23.4	21.7
		15	26.3	19.9	21.8	27.4	20.0	17.1
	Exp. 1 Mean		26.8	21.9	21.4	23.5	21.6	19.8
	2[d]	7	23.2	17.1	16.1	23.9	26.6	20.7
		12	26.0	22.0	19.8	21.6	26.1	22.1
		13	33.2	21.4	16.8	23.8	22.7	23.3
	Exp. 2 Mean		27.5	20.2	17.6	23.1	25.1	22.0
	Overall Mean		27.2	21.1	19.5	23.3	23.4	20.9

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B51. Study 1 hourly LPS[a] challenge calcium levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	10.4	9.9	8.4	8.7	9.3	10.1
		8	10.0	9.5	8.1	8.7	6.7	6.6
		13	11.0	10.5	10.4	9.7	10.5	9.5
	Exp. 1 Mean		10.5	10.0	9.0	9.0	8.8	8.7
	2[d]	1	11.1	9.9	10.6	9.7	9.8	10.5
		3	9.2	8.7	7.3	9.0	9.4	10.5
		14	9.6	7.0	7.0	9.4	8.8	10.2
	Exp. 2 Mean		10.0	8.5	8.3	9.4	9.3	10.4
	Overall Mean		10.2	9.3	8.6	9.2	9.1	9.6
L. reuteri DS-33	1[c]	2	10.9	10.6	9.2	9.3	10.8	11.3
		9	11.1	10.1	10.7	9.4	7.7	10.2
		12	10.7	10.4	8.1	9.3	8.2	7.8
	Exp. 1 Mean		10.9	10.4	9.3	9.3	8.9	9.8
	2[d]	2	11.1	10.7	6.4	9.2	8.6	8.7
		8	8.5	9.2	8.3	9.2	9.4	10.3
		15	8.3	8.4	7.1	9.5	9.0	10.2
	Exp. 2 Mean		9.3	9.4	7.3	9.3	9.0	9.7
	Overall Mean		10.1	9.9	8.3	9.3	9.0	9.8
L. reuteri WB-74	1[c]	1	10.6	10.5	12.6	9.4	9.1	9.0
		10	11.5	10.3	7.4	9.5	6.3	8.5
		14	11.0	10.2	9.1	8.8	7.3	8.6
	Exp. 1 Mean		11.0	10.3	9.7	9.2	7.6	8.7
	2[d]	4	11.6	11.5	6.8	8.9	8.6	9.8
		5	10.3	9.7	7.5	9.2	8.9	10.4
		11	9.7	8.9	8.1	9.5	9.0	10.4
	Exp. 2 Mean		10.5	10.0	7.5	9.2	8.8	10.2
	Overall Mean		10.8	10.2	8.6	9.2	8.2	9.5
L. reuteri WB-75	1[c]	4	10.8	10.2	9.3	9.3	9.2	9.8
		7	11.3	10.8	11.3	9.3	8.9	9.5
		11	11.1	10.2	11.1	9.4	8.5	7.9
	Exp. 1 Mean		11.1	10.4	10.6	9.3	8.9	9.1
	2[d]	6	10.5	8.0	8.8	9.7	9.7	10.1
		9	10.6	10.1	8.4	9.6	9.6	11.1
		10	10.4	9.9	7.8	10.0	9.9	11.1
	Exp. 2 Mean		10.5	9.3	8.3	9.8	9.7	10.8
	Overall Mean		10.8	9.9	9.5	9.6	9.3	9.9
L. acidophilus L-23	1[c]	5	11.0	10.7	10.3	9.4	8.6	9.1
		6	10.7	10.4	9.8	9.2	9.8	9.3
		15	10.6	10.1	9.7	9.4	7.9	7.9
	Exp. 1 Mean		10.8	10.4	9.9	9.3	8.8	8.8
	2[d]	7	10.6	8.3	8.4	9.7	8.9	9.7
		12	9.8	8.6	8.3	8.9	8.7	9.7
		13	10.8	8.1	7.6	9.7	9.3	10.0
	Exp. 2 Mean		10.4	8.3	8.1	9.4	9.0	9.8
	Overall Mean		10.6	9.4	9.0	9.4	8.9	9.3

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B52. Study 1 hourly LPS[a] challenge total protein levels (g/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	5.3	4.7	3.8	4.8	5.1	5.1
		8	5.1	4.7	4.2	4.4	3.3	2.7
		13	5.6	5.2	5.2	5.1	5.6	4.5
	Exp. 1 Mean		5.3	4.9	4.4	4.8	4.7	4.1
	2[d]	1	5.5	4.3	5.1	5.0	5.2	5.3
		3	4.8	4.0	3.2	4.7	5.0	5.3
		14	4.8	3.3	3.3	4.7	4.9	5.1
	Exp. 2 Mean		5.0	3.9	3.9	4.8	5.0	5.2
	Overall Mean		5.2	4.4	4.1	4.8	4.9	4.7
L. reuteri DS-33	1[c]	2	5.6	5.1	3.9	5.0	6.5	6.2
		9	4.9	4.3	4.9	4.4	3.7	4.7
		12	5.3	5.0	3.8	5.2	4.4	3.7
	Exp. 1 Mean		5.3	4.8	4.2	4.9	4.9	4.9
	2[d]	2	5.9	4.9	3.2	4.9	4.8	4.8
		8	3.9	3.8	3.7	4.5	4.8	4.9
		15	3.6	3.9	3.2	5.1	5.1	5.0
	Exp. 2 Mean		4.5	4.2	3.4	4.8	4.9	4.9
	Overall Mean		4.9	4.5	3.8	4.9	4.9	4.9
L. reuteri WB-74	1[c]	1	5.6	5.3	6.6	5.2	5.3	5.3
		10	5.8	4.9	3.2	5.1	3.0	4.8
		14	5.7	5.2	4.5	5.1	4.5	4.2
	Exp. 1 Mean		5.7	5.1	4.8	5.1	4.3	4.8
	2[d]	4	6.2	5.5	3.4	4.9	5.1	5.3
		5	5.5	4.9	3.9	5.0	5.0	5.2
		11	4.6	3.9	3.7	5.0	5.4	5.2
	Exp. 2 Mean		5.4	4.8	3.7	5.0	5.2	5.2
	Overall Mean		5.6	5.0	4.2	5.1	4.7	5.0
L. reuteri WB-75	1[c]	4	5.2	4.5	4.2	4.8	4.6	5.6
		7	5.2	4.8	5.1	4.4	4.2	4.4
		11	5.6	5.1	5.8	5.2	4.7	3.4
	Exp. 1 Mean		5.3	4.8	5.0	4.8	4.5	4.5
	2[d]	6	5.4	3.5	4.2	4.8	4.9	4.9
		9	4.7	4.5	3.9	4.8	4.9	5.1
		10	5.0	4.4	3.5	4.7	5.3	5.4
	Exp. 2 Mean		5.0	4.1	3.9	4.8	5.0	5.1
	Overall Mean		5.2	4.5	4.5	4.8	4.8	4.8
L. acidophilus L-23	1[c]	5	5.8	5.2	5.0	5.5	5.1	4.4
		6	5.3	4.9	4.7	4.8	5.7	4.4
		15	5.4	5.2	5.3	5.6	4.8	3.7
	Exp. 1 Mean		5.5	5.1	5.0	5.3	5.2	4.2
	2[d]	7	5.6	4.2	4.1	5.5	5.4	5.4
		12	5.3	4.2	4.6	5.1	5.3	5.1
		13	6.3	4.3	3.8	5.4	5.5	5.7
	Exp. 2 Mean		5.7	4.2	4.2	5.3	5.4	5.4
	Overall Mean		5.6	4.7	4.6	5.3	5.3	4.8

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B53. Study 1 hourly LPS[a] challenge albumin levels (g/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	3.5	2.9	2.3	3.0	3.1	3.2
		8	3.2	2.8	2.4	2.6	1.8	1.4
		13	3.2	2.9	2.8	2.9	3.1	2.4
	Exp. 1 Mean		3.3	2.9	2.5	2.8	2.7	2.3
	2[d]	1	3.8	2.8	3.5	3.4	3.5	3.5
		3	2.7	2.2	1.7	2.7	2.8	2.8
		14	2.6	1.7	1.6	2.5	2.7	2.7
	Exp. 2 Mean		3.0	2.2	2.3	2.9	3.0	3.0
	Overall Mean		3.2	2.6	2.4	2.9	2.8	2.7
L. reuteri DS-33	1[c]	2	3.8	3.5	2.5	3.3	4.3	4.0
		9	3.4	2.7	3.2	2.9	2.2	3.0
		12	3.8	3.5	2.5	3.6	2.9	2.3
	Exp. 1 Mean		3.7	3.2	2.7	3.3	3.1	3.1
	2[d]	2	3.8	3.2	1.8	3.1	2.9	2.8
		8	2.3	2.3	2.2	2.7	3.0	3.0
		15	2.0	2.2	1.7	3.1	3.1	2.9
	Exp. 2 Mean		2.7	2.6	1.9	3.0	3.0	2.9
	Overall Mean		3.2	2.9	2.3	3.1	3.1	3.0
L. reuteri WB-74	1[c]	1	3.8	3.5	4.4	3.4	3.3	3.3
		10	4.3	3.4	2.0	3.5	1.8	3.0
		14	3.2	2.8	2.4	2.8	2.3	2.2
	Exp. 1 Mean		3.8	3.2	2.9	3.2	2.5	2.8
	2[d]	4	3.5	3.0	1.7	2.6	2.7	2.7
		5	3.0	2.6	1.9	2.6	2.6	2.6
		11	3.0	2.5	2.3	3.4	3.7	3.3
	Exp. 2 Mean		3.2	2.7	2.0	2.9	3.0	2.9
	Overall Mean		3.5	3.0	2.5	3.1	2.7	2.9
L. reuteri WB-75	1[c]	4	3.6	3.1	2.8	3.1	3.0	3.7
		7	3.4	3.0	3.2	2.8	2.6	2.6
		11	3.7	3.2	3.8	3.3	2.9	2.0
	Exp. 1 Mean		3.6	3.1	3.3	3.1	2.8	2.8
	2[d]	6	3.4	2.0	2.5	2.9	3.1	2.9
		9	3.2	3.1	2.5	3.2	3.1	3.3
		10	2.9	2.6	2.0	2.7	3.1	3.1
	Exp. 2 Mean		3.2	2.6	2.3	2.9	3.1	3.1
	Overall Mean		3.4	2.8	2.8	3.0	3.0	2.9
L. acidophilus L-23	1[c]	5	4.2	3.7	3.6	3.8	3.5	2.9
		6	3.2	2.9	2.7	2.8	3.4	2.6
		15	3.4	3.2	3.3	3.7	2.9	2.1
	Exp. 1 Mean		3.6	3.3	3.2	3.4	3.3	2.5
	2[d]	7	3.5	2.5	2.6	3.5	3.4	3.3
		12	2.9	2.1	2.4	2.8	3.0	2.7
		13	4.2	2.7	2.4	3.7	3.6	3.6
	Exp. 2 Mean		3.5	2.4	2.5	3.3	3.3	3.2
	Overall Mean		3.6	2.9	2.8	3.4	3.3	2.9

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B54. Study 1 hourly LPS[a] challenge globulin levels (g/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	1.7	1.7	1.5	1.8	2.0	1.9
		8	2.0	2.0	1.7	1.8	1.5	1.3
		13	2.4	2.4	2.4	2.2	2.5	2.1
	Exp. 1 Mean		2.0	2.0	1.9	1.9	2.0	1.8
	2[d]	1	1.7	1.5	1.6	1.6	1.7	1.9
		3	2.1	1.8	1.5	2.0	2.2	2.4
		14	2.2	1.6	1.6	2.2	2.2	2.4
	Exp. 2 Mean		2.0	1.6	1.6	1.9	2.0	2.2
	Overall Mean		2.0	1.8	1.7	1.9	2.0	2.0
L. reuteri DS-33	1[c]	2	1.8	1.6	1.4	1.7	2.1	2.2
		9	1.5	1.6	1.7	1.5	1.5	1.7
		12	1.5	1.6	1.3	1.6	1.5	1.4
	Exp. 1 Mean		1.6	1.6	1.5	1.6	1.7	1.8
	2[d]	2	2.1	1.8	1.4	1.8	1.9	2.0
		8	1.6	1.5	1.6	1.7	1.8	1.9
		15	1.6	1.7	1.5	2.0	2.0	2.1
	Exp. 2 Mean		1.8	1.7	1.5	1.8	1.9	2.0
	Overall Mean		1.7	1.6	1.5	1.7	1.8	1.9
L. reuteri WB-74	1[c]	1	1.8	1.8	2.3	1.8	2.0	2.0
		10	1.5	1.4	1.1	1.6	1.2	1.8
		14	2.4	2.3	2.1	2.3	2.2	2.0
	Exp. 1 Mean		1.9	1.8	1.8	1.9	1.8	1.9
	2[d]	4	2.7	2.5	1.7	2.3	2.3	2.6
		5	2.5	2.3	2.0	2.4	2.4	2.5
		11	1.5	1.4	1.4	1.6	1.7	1.9
	Exp. 2 Mean		2.2	2.1	1.7	2.1	2.1	2.3
	Overall Mean		2.1	2.0	1.8	2.0	2.0	2.1
L. reuteri WB-75	1[c]	4	1.6	1.4	1.4	1.6	1.6	1.9
		7	1.8	1.8	1.9	1.6	1.6	1.8
		11	1.9	1.8	2.1	1.9	1.8	1.4
	Exp. 1 Mean		1.8	1.7	1.8	1.7	1.7	1.7
	2[d]	6	2.1	1.5	1.8	1.9	1.8	2.0
		9	1.5	1.4	1.5	1.6	1.7	1.8
		10	2.1	1.8	1.5	1.9	2.2	2.3
	Exp. 2 Mean		1.9	1.6	1.6	1.8	1.9	2.0
	Overall Mean		1.8	1.6	1.7	1.8	1.8	1.9
L. acidophilus L-23	1[c]	5	1.6	1.5	1.4	1.7	1.6	1.5
		6	2.1	2.0	2.0	2.0	2.3	1.8
		15	2.0	2.0	2.0	1.9	2.0	1.6
	Exp. 1 Mean		1.9	1.8	1.8	1.9	2.0	1.6
	2[d]	7	2.1	1.8	1.6	2.0	2.0	2.2
		12	2.4	2.1	2.2	2.3	2.4	2.4
		13	2.1	1.7	1.5	1.7	1.9	2.1
	Exp. 2 Mean		2.2	1.9	1.8	2.0	2.1	2.2
	Overall Mean		2.1	1.9	1.8	1.9	2.0	1.9

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B55. Study 1 hourly LPS[a] challenge albumin:globulin ratio levels

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	2.0	1.7	1.6	1.7	1.6	1.7
		8	1.6	1.4	1.4	1.5	1.2	1.1
		13	1.4	1.2	1.1	1.3	1.3	1.2
	Exp. 1 Mean		1.7	1.4	1.4	1.5	1.4	1.3
	2[d]	1	2.3	2.0	2.2	2.1	2.0	1.9
		3	1.3	1.2	1.2	1.3	1.2	1.2
		14	1.2	1.0	1.0	1.1	1.2	1.1
	Exp. 2 Mean		1.6	1.4	1.5	1.5	1.5	1.4
	Overall Mean		1.6	1.4	1.4	1.5	1.4	1.4
L. reuteri DS-33	1[c]	2	2.2	2.2	1.8	1.9	2.0	1.8
		9	2.2	1.7	1.9	1.9	1.5	1.7
		12	2.4	2.2	1.9	2.2	1.9	1.7
	Exp. 1 Mean		2.3	2.0	1.9	2.0	1.8	1.7
	2[d]	2	1.8	1.8	1.2	1.7	1.6	1.5
		8	1.5	1.5	1.4	1.6	1.7	1.6
		15	1.2	1.3	1.2	1.5	1.5	1.4
	Exp. 2 Mean		1.5	1.5	1.3	1.6	1.6	1.5
	Overall Mean		1.9	1.8	1.6	1.8	1.7	1.6
L. reuteri WB-74	1[c]	1	2.1	2.0	1.9	1.9	1.6	1.6
		10	2.8	2.4	1.9	2.2	1.6	1.7
		14	1.3	1.2	1.1	1.2	1.1	1.1
	Exp. 1 Mean		2.1	1.9	1.6	1.8	1.4	1.5
	2[d]	4	1.3	1.2	1.0	1.1	1.2	1.1
		5	1.2	1.2	1.0	1.1	1.1	1.0
		11	2.0	1.8	1.7	2.1	2.2	1.8
	Exp. 2 Mean		1.5	1.4	1.2	1.4	1.5	1.3
	Overall Mean		1.8	1.6	1.4	1.6	1.5	1.4
L. reuteri WB-75	1[c]	4	2.2	2.1	2.0	1.9	1.8	2.0
		7	1.9	1.7	1.6	1.7	1.6	1.5
		11	1.9	1.7	1.8	1.7	1.6	1.4
	Exp. 1 Mean		2.0	1.8	1.8	1.8	1.7	1.6
	2[d]	6	1.6	1.4	1.4	1.6	1.7	1.5
		9	2.2	2.2	1.7	1.9	1.8	1.9
		10	1.4	1.4	1.3	1.4	1.5	1.3
	Exp. 2 Mean		1.7	1.7	1.5	1.6	1.7	1.6
	Overall Mean		1.9	1.8	1.6	1.7	1.7	1.6
L. acidophilus L-23	1[c]	5	2.7	2.6	2.5	2.3	2.3	1.9
		6	1.5	1.4	1.4	1.4	1.5	1.5
		15	1.7	1.6	1.6	2.0	1.5	1.3
	Exp. 1 Mean		2.0	1.9	1.8	1.9	1.8	1.6
	2[d]	7	1.7	1.4	1.6	1.7	1.7	1.5
		12	1.2	1.0	1.1	1.2	1.3	1.1
		13	2.0	1.6	1.6	2.1	1.9	1.7
	Exp. 2 Mean		1.6	1.3	1.4	1.7	1.6	1.4
	Overall Mean		1.8	1.6	1.6	1.8	1.7	1.5

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

Table B56. Study 1 hourly LPS[a] challenge AST[b] levels (U/L)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	52	57	53	81	94	50
		8	55	62	75	73	72	31
		13	54	56	59	68	76	38
	Exp. 1 Mean		54	58	62	74	81	40
	2[e]	1	43	53	66	86	123	63
		3	39	33	32	62	70	54
		14	62	46	49	92	127	83
	Exp. 2 Mean		48	44	49	80	107	67
	Overall Mean		51	51	56	77	94	53
L. reuteri DS-33	1[d]	2	50	65	47	81	140	77
		9	46	48	54	54	46	59
		12	53	60	49	90	80	37
	Exp. 1 Mean		50	58	50	75	89	58
	2[e]	2	38	40	27	58	67	76
		8	43	44	56	79	86	72
		15	37	40	33	55	84	44
	Exp. 2 Mean		39	41	39	64	79	64
	Overall Mean		45	50	44	70	84	61
L. reuteri WB-74	1[d]	1	57	60	88	77	85	62
		10	50	57	50	86	62	73
		14	53	57	49	60	58	37
	Exp. 1 Mean		53	58	62	74	68	57
	2[e]	4	56	52	43	100	176	102
		5	60	43	42	63	76	52
		11	52	72	81	143	161	108
	Exp. 2 Mean		56	56	55	102	138	87
	Overall Mean		55	57	59	88	103	72
L. reuteri WB-75	1[d]	4	41	48	53	58	66	66
		7	59	75	87	91	105	87
		11	62	76	40	104	146	72
	Exp. 1 Mean		54	66	60	84	106	75
	2[e]	6	59	36	49	51	55	44
		9	47	56	59	89	146	69
		10	44	56	56	96	126	79
	Exp. 2 Mean		50	49	55	79	109	64
	Overall Mean		52	58	57	82	107	70
L. acidophilus L-23	1[d]	5	70	71	77	83	79	65
		6	45	56	61	70	102	53
		15	77	83	90	104	97	48
	Exp. 1 Mean		64	70	76	86	93	55
	2[e]	7	45	34	42	49	64	45
		12	65	52	76	108	140	87
		13	72	68	74	124	187	98
	Exp. 2 Mean		61	51	64	94	130	77
	Overall Mean		62	61	70	90	112	66

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]AST - aspartate aminotransferase

[c]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B57. Study 1 hourly LPS[a] challenge ALT[b] levels (U/L)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	59	57	52	65	69	63
		8	59	57	53	61	49	39
		13	66	67	65	71	79	54
	Exp. 1 Mean		61	60	57	66	66	52
	2[e]	1	34	34	35	39	49	40
		3	25	33	25	29	35	32
		14	59	48	47	62	72	70
	Exp. 2 Mean		39	38	36	43	52	47
	Overall Mean		50	49	46	55	59	50
L. reuteri DS-33	1[d]	2	45	50	37	49	64	54
		9	58	54	56	60	55	52
		12	81	80	66	94	81	60
	Exp. 1 Mean		61	61	53	68	67	55
	2[e]	2	34	33	29	36	42	37
		8	28	31	33	35	41	37
		15	29	31	29	34	42	34
	Exp. 2 Mean		30	32	30	35	42	36
	Overall Mean		46	47	42	51	54	46
L. reuteri WB-74	1[d]	1	65	65	74	68	73	63
		10	53	52	40	58	42	49
		14	53	51	45	57	52	44
	Exp. 1 Mean		57	56	53	61	56	52
	2[e]	4	50	46	37	48	58	54
		5	34	34	31	36	40	36
		11	41	40	40	55	63	56
	Exp. 2 Mean		42	40	36	46	54	49
	Overall Mean		49	48	45	54	55	50
L. reuteri WB-75	1[d]	4	46	46	44	54	55	56
		7	50	51	58	56	54	49
		11	52	56	66	70	62	46
	Exp. 1 Mean		49	51	56	60	57	50
	2[e]	6	54	42	47	50	57	49
		9	55	53	49	55	61	56
		10	30	31	31	37	43	39
	Exp. 2 Mean		46	42	42	47	54	48
	Overall Mean		48	47	49	54	55	49
L. acidophilus L-23	1[d]	5	60	59	56	66	64	55
		6	42	46	44	50	57	45
		15	71	76	70	82	76	56
	Exp. 1 Mean		58	60	57	66	66	52
	2[e]	7	41	37	37	44	48	43
		12	30	27	31	35	40	40
		13	41	36	37	45	58	52
	Exp. 2 Mean		37	33	35	41	49	45
	Overall Mean		48	47	46	54	57	49

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]ALT - alanine aminotransferase

[c]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B58. Study 1 hourly LPS[a] challenge ALKPhos[b] levels (U/L)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	226	210	179	210	289	206
		8	291	273	221	244	197	133
		13	247	247	239	220	289	186
	Exp. 1 Mean		255	243	213	225	258	175
	2[e]	1	204	164	231	183	250	224
		3	156	138	112	150	195	195
		14	198	130	120	180	224	208
	Exp. 2 Mean		186	144	154	171	223	209
	Overall Mean		220	194	184	198	241	192
L. reuteri DS-33	1[d]	2	263	264	188	263	383	268
		9	230	208	236	200	195	196
		12	257	238	168	210	183	149
	Exp. 1 Mean		250	237	197	224	254	204
	2[e]	2	188	172	99	152	233	284
		8	114	116	111	129	154	145
		15	93	96	84	124	118	119
	Exp. 2 Mean		132	128	98	135	168	183
	Overall Mean		191	182	148	180	211	194
L. reuteri WB-74	1[d]	1	263	265	321	230	293	206
		10	336	306	178	320	176	312
		14	315	301	259	279	237	190
	Exp. 1 Mean		305	291	253	276	235	236
	2[e]	4	247	232	127	199	222	200
		5	161	150	105	134	152	140
		11	231	193	174	229	273	255
	Exp. 2 Mean		213	192	135	187	216	198
	Overall Mean		259	241	194	232	226	217
L. reuteri WB-75	1[d]	4	278	260	235	263	293	257
		7	207	219	226	191	246	199
		11	262	257	294	272	324	170
	Exp. 1 Mean		249	245	252	242	288	209
	2[e]	6	252	169	198	224	262	233
		9	199	207	168	214	234	199
		10	212	194	139	195	228	214
	Exp. 2 Mean		221	190	168	211	241	215
	Overall Mean		235	218	210	227	265	212
L. acidophilus L-23	1[d]	5	229	209	188	205	242	176
		6	289	297	273	256	420	247
		15	166	184	196	194	176	105
	Exp. 1 Mean		228	230	219	218	279	176
	2[e]	7	197	153	148	188	232	208
		12	152	121	122	128	164	141
		13	196	135	113	175	224	216
	Exp. 2 Mean		182	136	128	164	207	188
	Overall Mean		205	183	173	191	243	182

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]ALKPhos - alkaline phosphatase

[c]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B59. Study 1 hourly LPS[a] challenge bili, total levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0[c]	Hour 1.5[c]	Hour 3.0[c]	Hour 6.0[c]	Hour 12	Hour 24[c]
Control	1[d]	3	0.2	0.3	0.3	0.6	1.0	0.1
		8	0.1	0.3	0.6	0.6	0.7	0.1
		13	0.1	0.1	0.2	0.2	0.8	0.1
	Exp. 1 Mean		0.1	0.2	0.4	0.5	0.8	0.1
	2[e]	1	0.2	0.2	0.2	0.2	0.9	0.1
		3	0.2	0.1	0.1	0.2	0.5	0.1
		14	0.1	0.1	0.1	0.2	0.8	0.1
	Exp. 2 Mean		0.2	0.1	0.1	0.2	0.7	0.1
	Overall Mean		0.2	0.2	0.3	0.3	0.8	0.1
L. reuteri DS-33	1[d]	2	0.2	0.3	0.3	0.6	0.8	0.3
		9	0.3	0.2	0.1	0.3	0.9	0.1
		12	0.2	0.2	0.1	0.5	0.5	0.1
	Exp. 1 Mean		0.2	0.2	0.2	0.5	0.7	0.2
	2[e]	2	0.2	0.1	0.1	0.1	0.6	0.1
		8	0.1	0.1	0.1	0.1	0.3	0.1
		15	0.1	0.2	0.1	0.1	0.3	0.1
	Exp. 2 Mean		0.1	0.1	0.1	0.1	0.4	0.1
	Overall Mean		0.2	0.2	0.1	0.3	0.6	0.1
L. reuteri WB-74	1[d]	1	0.2	0.2	0.4	0.7	1.5	0.2
		10	0.3	0.2	0.1	0.5	0.4	0.9
		14	0.1	0.2	0.1	0.3	0.6	0.1
	Exp. 1 Mean		0.2	0.2	0.2	0.5	0.8	0.4
	2[e]	4	0.1	0.3	0.3	0.3	0.6	0.1
		5	0.2	0.1	0.1	0.2	0.4	0.1
		11	0.1	0.1	0.1	0.3	1.3	0.1
	Exp. 2 Mean		0.1	0.2	0.2	0.3	0.8	0.1
	Overall Mean		0.2	0.2	0.2	0.4	0.8	0.3
L. reuteri WB-75	1[d]	4	0.3	0.1	0.1	0.3	0.8	0.2
		7	0.2	0.4	0.5	0.8	1.0	0.1
		11	0.1	0.2	0.3	0.9	1.1	0.1
	Exp. 1 Mean		0.2	0.2	0.3	0.7	1.0	0.1
	2[e]	6	0.3	0.1	0.1	0.1	0.5	0.1
		9	0.1	0.1	0.1	0.3	0.2	0.1
		10	0.1	0.1	0.1	0.1	0.2	0.1
	Exp. 2 Mean		0.2	0.1	0.1	0.2	0.3	0.1
	Overall Mean		0.2	0.2	0.2	0.4	0.6	0.1
L. acidophilus L-23	1[d]	5	0.3	0.2	0.2	0.3	0.6	0.1
		6	0.2	0.2	0.2	0.5	1.1	0.1
		15	0.1	0.2	0.2	0.3	0.7	0.1
	Exp. 1 Mean		0.2	0.2	0.2	0.4	0.8	0.1
	2[e]	7	0.1	0.1	0.1	0.1	0.5	0.1
		12	0.3	0.1	0.3	0.3	0.3	0.1
		13	0.4	0.4	0.3	0.3	0.8	0.1
	Exp. 2 Mean		0.3	0.2	0.2	0.2	0.5	0.1
	Overall Mean		0.2	0.2	0.2	0.3	0.7	0.1

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]All 0.1 individual pig values were equal to <0.1

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B60. Study 1 hourly LPS[a] challenge cholesterol levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	65	54	50	58	73	68
		8	88	76	62	65	50[e]	50[e]
		13	70	64	59	54	65	53
	Exp. 1 Mean		74	65	57	59	63	57
	2[d]	1	95	67	85	75	79	89
		3	82	67	50[e]	71	80	89
		14	83	52	50[e]	63	77	87
	Exp. 2 Mean		87	62	62	70	79	88
	Overall Mean		81	63	59	64	71	73
L. reuteri DS-33	1[c]	2	71	66	50	61	80	97
		9	59	50[e]	50	50[e]	50[e]	59
		12	82	74	52	70	59	53
	Exp. 1 Mean		71	63	51	60	63	70
	2[d]	2	97	80	50[e]	62	58	65
		8	81	77	69	83	91	101
		15	50[e]	50	50[e]	52	57	66
	Exp. 2 Mean		76	69	56	66	69	77
	Overall Mean		73	66	54	63	66	74
L. reuteri WB-74	1[c]	1	51	50[e]	64	50	50[e]	50[e]
		10	83	65	50	62	50[e]	70
		14	60	56	50	57	53	50[e]
	Exp. 1 Mean		65	57	55	56	51	57
	2[d]	4	101	87	50[e]	67	79	76
		5	76	66	50[e]	63	71	76
		11	72	57	51	73	78	72
	Exp. 2 Mean		83	70	50	68	76	75
	Overall Mean		74	64	53	62	64	66
L. reuteri WB-75	1[c]	4	81	68	58	65	60	86
		7	82	72	74	61	71	71
		11	104	93	101	86	89	55
	Exp. 1 Mean		89	78	78	71	73	71
	2[d]	6	84	50[e]	58	61	57	64
		9	52	50[e]	50[e]	50[e]	50[e]	53
		10	82	69	50[e]	69	89	98
	Exp. 2 Mean		73	56	53	60	65	72
	Overall Mean		81	67	65	65	69	71
L. acidophilus L-23	1[c]	5	89	81	71	74	72	72
		6	81	74	66	62	84	67
		15	79	76	70	69	58	50[e]
	Exp. 1 Mean		83	77	69	68	71	63
	2[d]	7	85	61	59	73	69	83
		12	86	68	66	68	81	84
		13	109	70	57	85	90	102
	Exp. 2 Mean		93	66	61	75	80	90
	Overall Mean		88	72	65	72	76	76

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

[e]Values were equal to <50

Table B61. Study 1 hourly LPS[a] challenge triglyceride levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	3	15	25	16	27	120	29
		8	30	26	21	18	55	25
		13	26	26	32	19	39	20
	Exp. 1 Mean		24	26	23	21	71	25
	2[d]	1	28	23	23	15	46	57
		3	40	25	16	27	55	33
		14	42	23	27	18	41	32
	Exp. 2 Mean		37	24	22	20	47	41
	Overall Mean		30	25	23	21	59	33
L. reuteri DS-33	1[c]	2	21	33	18	25	67	50
		9	37	31	23	19	65	36
		12	24	19	17	29	112	32
	Exp. 1 Mean		27	28	19	24	81	39
	2[d]	2	44	38	27	21	28	53
		8	35	51	27	24	35	49
		15	15	16	12	11	30	27
	Exp. 2 Mean		31	35	22	19	31	43
	Overall Mean		29	31	21	22	56	41
L. reuteri WB-74	1[c]	1	23	34	45	26	76	22
		10	36	46	15	30	29	166
		14	52	52	53	69	155	31
	Exp. 1 Mean		37	44	38	42	87	73
	2[d]	4	36	41	27	17	31	32
		5	28	13	10[e]	13	19	18
		11	31	27	28	27	70	35
	Exp. 2 Mean		32	27	22	19	40	28
	Overall Mean		34	36	30	30	63	51
L. reuteri WB-75	1[c]	4	19	26	13	23	65	23
		7	28	42	39	35	142	33
		11	36	34	40	48	198	44
	Exp. 1 Mean		28	34	31	35	135	33
	2[d]	6	41	14	18	18	29	33
		9	28	30	15	24	27	40
		10	68	32	17	19	32	55
	Exp. 2 Mean		46	25	17	20	29	43
	Overall Mean		37	30	24	28	82	38
L. acidophilus L-23	1[c]	5	31	28	27	27	76	28
		6	20	25	21	22	143	25
		15	25	20	16	15	31	14
	Exp. 1 Mean		25	24	21	21	83	22
	2[d]	7	44	25	26	24	34	40
		12	77	39	27	23	58	67
		13	79	35	34	36	75	64
	Exp. 2 Mean		67	33	29	28	56	57
	Overall Mean		46	29	25	25	70	40

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table B2

[c]Experiment 1 were barrows

[d]Experiment 2 were gilts

[e]Value was equal to <10

Table B62. Study 1 hourly LPS[a] challenge HDL[b] levels (mg/dL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	24	21	17	18	22	18
		8	33	29	23	19	13	12
		13	24	22	21	14	13	14
	Exp. 1 Mean		27	24	20	17	16	15
	2[e]	1	28	21	27	19	16	19
		3	25	20	16	19	18	21
		14	25	16	15	14	15	20
	Exp. 2 Mean		26	19	19	17	16	20
	Overall Mean		27	22	20	17	16	17
L. reuteri DS-33	1[d]	2	30	28	20	20	16	15
		9	25	21	21	13	11	16
		12	34	31	21	20	15	17
	Exp. 1 Mean		30	27	21	18	14	16
	2[e]	2	35	29	17	18	11	10
		8	28	27	23	22	20	26
		15	18	20	15	18	16	22
	Exp. 2 Mean		27	25	18	19	16	19
	Overall Mean		28	26	20	19	15	18
L. reuteri WB-74	1[d]	1	18	17	21	11	10	7
		10	30	25	14	17	7	10
		14	18	17	14	13	10	12
	Exp. 1 Mean		22	20	16	14	9	10
	2[e]	4	35	31	16	19	25	23
		5	22	19	13	16	19	21
		11	28	23	20	23	21	21
	Exp. 2 Mean		28	24	16	19	22	22
	Overall Mean		25	22	16	17	15	16
L. reuteri WB-75	1[d]	4	30	25	22	19	15	13
		7	34	31	31	21	20	14
		11	38	34	36	23	19	12
	Exp. 1 Mean		34	30	30	21	18	13
	2[e]	6	31	20	24	20	13	17
		9	19	19	14	13	12	15
		10	25	21	15	18	21	25
	Exp. 2 Mean		25	20	18	17	15	19
	Overall Mean		30	25	24	19	17	16
L. acidophilus L-23	1[d]	5	34	31	28	20	14	10
		6	31	28	26	17	20	16
		15	31	30	29	21	14	10
	Exp. 1 Mean		32	30	28	19	16	12
	2[e]	7	30	21	20	22	13	19
		12	30	24	22	18	18	22
		13	35	22	18	23	22	19
	Exp. 2 Mean		32	22	20	21	18	20
	Overall Mean		32	26	24	20	17	16

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]HDL - high-density lipoprotein

[c]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B63. Study 1 hourly LPS[a] challenge VLDL[b] levels (mg/dL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	3	5	3	5	24	6
		8	6	5	4	4	11	5
		13	5	5	6	4	8	4
	Exp. 1 Mean		5	5	4	4	14	5
	2[e]	1	6	5	5	3	9	11
		3	8	5	3	5	11	7
		14	8	5	5	4	8	6
	Exp. 2 Mean		7	5	4	4	9	8
	Overall Mean		6	5	4	4	12	7
L. reuteri DS-33	1[d]	2	4	7	4	5	13	10
		9	7	6	5	4	13	7
		12	5	4	3	6	22	6
	Exp. 1 Mean		5	6	4	5	16	8
	2[e]	2	9	8	5	4	6	11
		8	7	10	5	5	7	10
		15	3	3	2	2	6	5
	Exp. 2 Mean		6	7	4	4	6	9
	Overall Mean		6	6	4	4	11	8
L. reuteri WB-74	1[d]	1	5	7	9	5	15	4
		10	7	9	3	6	6	33
		14	10	10	11	14	31	6
	Exp. 1 Mean		7	9	8	8	17	14
	2[e]	4	7	8	5	3	6	6
		5	6	3	NA[f]	3	4	4
		11	6	5	3	5	14	7
	Exp. 2 Mean		6	5	4	4	8	6
	Overall Mean		7	7	6	6	13	10
L. reuteri WB-75	1[d]	4	4	5	3	5	13	5
		7	6	8	8	7	28	7
		11	7	7	8	10	40	9
	Exp. 1 Mean		6	7	6	7	27	7
	2[e]	6	8	3	4	4	6	7
		9	6	6	3	5	5	8
		10	14	6	3	4	6	11
	Exp. 2 Mean		9	5	3	4	6	9
	Overall Mean		8	6	5	6	16	8
L. acidophilus L-23	1[d]	5	6	6	5	5	15	6
		6	4	5	4	4	29	5
		15	5	4	3	3	6	3
	Exp. 1 Mean		5	5	4	4	17	5
	2[e]	7	9	5	5	5	13	8
		12	15	8	5	5	12	13
		13	16	7	5	7	15	19
	Exp. 2 Mean		13	7	5	6	13	13
	Overall Mean		9	6	5	5	15	9

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]VLDL - very low-density lipoprotein

[c]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

[f]NA - not analyzed

Table B64. Study 1 hourly LPS[a] challenge IgA[b] levels (mg/mL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	0.775	0.722	0.513	0.276	0.148	0.407
		8	0.313	0.326	0.387	0.145	0.196	0.160
		13	0.591	0.510	0.416	0.197	0.181	0.262
	Exp. 1 Mean		0.560	0.519	0.438	0.206	0.175	0.276
	2[e]	1	0.370	0.379	0.327	0.327	0.449	0.366
		3	0.358	0.345	0.299	0.250	0.289	0.522
		14	0.784	0.717	0.644	0.443	0.453	0.409
	Exp. 2 Mean		0.504	0.480	0.423	0.340	0.397	0.432
	Overall Mean		0.532	0.500	0.431	0.273	0.286	0.354
L. reuteri DS-33	1[d]	2	0.445	0.418	0.385	0.191	0.178	0.221
		9	0.442	0.385	0.439	0.155	0.255	0.317
		12	0.903	0.787	0.836	0.257	0.245	0.331
	Exp. 1 Mean		0.597	0.530	0.553	0.201	0.226	0.290
	2[e]	2	0.999	0.706	0.611	0.369	0.711	0.692
		8	0.502	0.615	0.321	0.659	0.504	0.528
		15	0.526	0.369	0.601	0.374	0.380	0.360
	Exp. 2 Mean		0.676	0.564	0.511	0.467	0.532	0.527
	Overall Mean		0.636	0.547	0.532	0.334	0.379	0.408
L. reuteri WB-74	1[d]	1	0.561	0.406	0.326	0.186	0.238	0.364
		10	0.534	0.513	0.510	0.258	0.200	0.258
		14	0.896	0.516	0.134	0.244	0.266	0.320
	Exp. 1 Mean		0.664	0.478	0.323	0.229	0.234	0.314
	2[e]	4	0.358	0.293	0.270	0.236	0.273	0.275
		5	0.619	0.921	0.941	0.811	0.691	0.482
		11	1.414	0.736	0.672	1.003	0.601	1.101
	Exp. 2 Mean		0.797	0.650	0.628	0.684	0.522	0.619
	Overall Mean		0.730	0.564	0.475	0.456	0.378	0.467
L. reuteri WB-75	1[d]	4	0.620	0.528	0.371	0.234	0.229	0.400
		7	0.955	0.886	1.335	0.248	0.307	0.309
		11	0.524	0.371	0.467	0.224	0.188	0.208
	Exp. 1 Mean		0.700	0.595	0.724	0.235	0.241	0.306
	2[e]	6	0.312	0.303	0.189	0.309	0.229	0.209
		9	0.250	0.227	0.197	0.352	0.270	0.282
		10	0.494	0.502	0.298	0.421	0.556	0.483
	Exp. 2 Mean		0.352	0.344	0.228	0.361	0.351	0.324
	Overall Mean		0.526	0.469	0.476	0.298	0.296	0.315
L. acidophilus L-23	1[d]	5	0.516	0.503	0.787	0.202	0.201	0.239
		6	0.532	0.516	0.617	0.261	0.271	0.271
		15	0.330	0.886	0.126	0.157	0.158	0.203
	Exp. 1 Mean		0.459	0.635	0.510	0.207	0.210	0.238
	2[e]	7	0.898	0.689	0.662	0.889	0.648	0.527
		12	0.248	0.307	0.461	0.335	0.293	0.259
		13	0.332	0.210	0.457	0.216	0.225	0.228
	Exp. 2 Mean		0.493	0.402	0.527	0.480	0.389	0.338
	Overall Mean		0.476	0.519	0.518	0.343	0.299	0.288

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]IgA - immunoglobulin A

[c]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B65. Study 1 hourly LPS[a] challenge IgG[b] levels (mg/mL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	7.098	4.851	5.984	5.690	5.391	4.415
		8	4.553	4.389	5.342	5.943	3.495	4.430
		13	9.335	6.526	5.452	3.331	2.914	3.783
	Exp. 1 Mean		6.995	5.255	5.593	4.988	3.933	4.209
	2[e]	1	9.195	3.158	2.574	2.713	2.903	2.791
		3	12.260	2.667	2.901	2.484	2.678	4.861
		14	7.057	6.119	11.460	5.604	5.559	4.444
	Exp. 2 Mean		9.504	3.981	5.645	3.600	3.713	4.032
	Overall Mean		8.250	4.618	5.619	4.294	3.823	4.121
L. reuteri DS-33	1[d]	2	4.075	2.871	6.292	3.031	2.652	1.373
		9	5.112	4.343	4.516	2.298	3.571	3.090
		12	9.920	9.851	7.329	9.218	5.706	6.114
	Exp. 1 Mean		6.369	5.688	6.046	4.849	3.976	3.526
	2[e]	2	11.470	4.250	2.900	4.082	3.122	3.803
		8	13.720	4.315	2.944	12.710	4.368	3.185
		15	4.178	4.111	9.400	3.185	2.759	3.171
	Exp. 2 Mean		9.789	4.225	5.081	6.659	3.416	3.386
	Overall Mean		8.079	4.957	5.564	5.754	3.696	3.456
L. reuteri WB-74	1[d]	1	5.113	7.037	6.290	5.249	4.465	3.579
		10	5.970	5.942	5.181	3.548	2.878	4.428
		14	9.550	9.666	6.159	6.689	3.719	4.932
	Exp. 1 Mean		6.878	7.548	5.877	5.162	3.687	4.313
	2[e]	4	9.874	2.450	2.349	3.358	2.403	2.671
		5	10.640	2.676	2.597	7.979	2.634	2.403
		11	9.277	2.610	2.745	3.538	2.421	2.805
	Exp. 2 Mean		9.930	2.579	2.564	4.958	2.486	2.626
	Overall Mean		8.404	5.064	4.220	5.060	3.087	3.470
L. reuteri WB-75	1[d]	4	7.555	7.019	6.795	6.269	4.919	5.771
		7	6.725	8.659	5.192	8.857	9.453	5.219
		11	5.317	6.509	7.466	3.188	3.479	2.574
	Exp. 1 Mean		6.532	7.396	6.484	6.105	5.950	4.521
	2[e]	6	14.080	3.889	2.906	7.718	2.934	2.602
		9	8.451	2.484	2.152	2.416	2.572	1.928
		10	7.629	2.586	2.067	2.088	2.448	2.083
	Exp. 2 Mean		10.053	2.986	2.375	4.074	2.651	2.204
	Overall Mean		8.293	5.191	4.430	5.089	4.301	3.363
L. acidophilus L-23	1[d]	5	8.947	9.675	8.350	8.342	6.768	6.286
		6	6.532	6.101	5.932	7.125	5.255	4.158
		15	9.013	6.703	5.899	6.526	5.144	3.841
	Exp. 1 Mean		8.164	7.493	6.727	7.331	5.722	4.762
	2[e]	7	12.690	5.148	4.895	9.644	4.312	3.655
		12	6.234	1.849	5.219	1.682	2.433	2.798
		13	16.300	2.794	9.928	9.909	2.401	2.889
	Exp. 2 Mean		11.741	3.264	6.681	7.078	3.049	3.114
	Overall Mean		9.953	5.378	6.704	7.205	4.386	3.938

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]IgG - immunoglobulin G

[c]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

Table B66. Study 1 hourly LPS[a] challenge IgM[b] levels (mg/mL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	3	1.756	1.755	1.829	1.125	1.294	1.561
		8	1.463	1.384	1.463	1.281	1.368	1.079
		13	1.434	1.964	1.840	0.682	0.689	1.058
	Exp. 1 Mean		1.551	1.701	1.711	1.029	1.117	1.233
	2[e]	1	0.920	0.316	0.257	0.271	0.290	0.279
		3	1.226	0.267	0.290	0.248	0.268	0.486
		14	0.706	0.612	1.146	0.560	0.556	0.444
	Exp. 2 Mean		0.950	0.398	0.565	0.360	0.371	0.403
	Overall Mean		1.251	1.050	1.138	0.695	0.744	0.818
L. reuteri DS-33	1[d]	2	1.072	1.064	1.094	0.987	0.956	0.865
		9	1.452	1.194	0.998	0.837	1.110	0.816
		12	1.544	2.020	1.550	0.808	0.969	0.915
	Exp. 1 Mean		1.356	1.426	1.214	0.877	1.012	0.865
	2[e]	2	1.147	0.425	0.290	0.408	0.312	0.380
		8	1.372	0.432	0.294	1.271	0.437	0.319
		15	0.418	0.411	0.940	0.319	0.276	0.317
	Exp. 2 Mean		0.979	0.423	0.508	0.666	0.342	0.339
	Overall Mean		1.167	0.924	0.861	0.772	0.677	0.602
L. reuteri WB-74	1[d]	1	0.856	1.329	1.552	1.147	1.177	1.235
		10	1.808	1.751	1.633	1.056	1.152	1.723
		14	2.044	1.869	1.940	1.150	0.821	1.652
	Exp. 1 Mean		1.569	1.650	1.708	1.118	1.050	1.537
	2[e]	4	0.987	0.245	0.235	0.336	0.240	0.267
		5	1.064	0.268	0.260	0.798	0.263	0.240
		11	0.928	0.261	0.275	0.354	0.242	0.281
	Exp. 2 Mean		0.993	0.258	0.256	0.496	0.249	0.263
	Overall Mean		1.281	0.954	0.982	0.807	0.649	0.900
L. reuteri WB-75	1[d]	4	1.645	1.366	1.712	0.766	0.776	0.947
		7	1.643	1.319	1.111	1.811	1.109	0.904
		11	1.786	1.308	1.064	0.645	0.808	1.161
	Exp. 1 Mean		1.691	1.331	1.296	1.074	0.897	1.004
	2[e]	6	1.408	0.389	0.291	0.772	0.293	0.260
		9	0.845	0.248	0.215	0.242	0.257	0.193
		10	0.763	0.259	0.207	0.209	0.245	0.208
	Exp. 2 Mean		1.005	0.299	0.238	0.407	0.265	0.220
	Overall Mean		1.348	0.815	0.767	0.741	0.581	0.612
L. acidophilus L-23	1[d]	5	2.073	2.528	4.021	1.415	1.343	1.485
		6	1.621	1.621	2.240	0.883	0.841	0.783
		15	1.279	1.583	1.167	1.312	0.655	0.726
	Exp. 1 Mean		1.658	1.911	2.476	1.203	0.946	0.998
	2[e]	7	1.269	0.515	0.490	0.964	0.431	0.366
		12	0.623	0.185	0.522	0.168	0.243	0.280
		13	1.630	0.279	0.993	0.991	0.240	0.289
	Exp. 2 Mean		1.174	0.326	0.668	0.708	0.305	0.311
	Overall Mean		1.416	1.119	1.572	0.956	0.626	0.655

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]IgM - immunoglobulin M

[c]Description of treatments, experiments, and pigs - see Table B2

[d]Experiment 1 were barrows

[e]Experiment 2 were gilts

APPENDIX C

STUDY 2 RAW DATA

Table C1. Study 2 treatment counts of lactobacilli[a] (Log_{10} cfu/mL)

Treatment[b]	Exp.	Day 0	Day 3 or 4
Control	1	0.92	1.20
	2	1.27	1.45
L. reuteri DS-36	1	8.02	7.94
	2	7.96	7.83
L. reuteri DS-37	1	8.14	8.19
	2	7.95	7.91
L. reuteri WB-72	1	7.98	7.60
	2	7.95	6.63
L. reuteri WB-76	1	8.04	7.59
	2	8.04	6.62

[a]Plated on deMan, Rogasa, Sharpe agar (MRSA)

[b]Ideal count for treatments was 8.00 log_{10} cfu/mL

Table C2. Swine assignments for study 2 feeding lactobacilli cultures

Study	Treatment[a]	Exp. 1 Pig[b]	Crate Number	Exp. 2 Pig[c]	Crate Number
2	Control	7-6	3	22-10	13
		17-4	15	28-10	10
		1-8	1	17-4	5
	L. reuteri DS-36	4-6	2	26-10	14
		7-4	4	17-13	8
		11-1	10	27-13	2
	L. reuteri DS-37	1-2	5	21-12	11
		4-2	11	28-11	6
		5-1	6	27-11	4
	L. reuteri WB-72	7-3	7	25-8	15
		14-3	8	21-11	7
		21-6	9	17-8	3
	L. reuteri WB-76	1-3	12	17-6	12
		7-1	13	13-10	9
		14-4	14	25-13	1

[a]All treatments were fed 10 mL twice a day; Lactobacilli concentrations fed were 1 x 10^9 cfu/mL

[b]Experiment 1 were all gilts (n=15)

[c]Experiment 2 were all barrows (n=15)

Table C3. Study 2 weekly swine weights (kg)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	8.26	10.43	13.34	17.33
		10	8.62	11.34	15.24	18.51
		13	10.80	13.52	16.69	19.96
	Exp. 1 Mean		9.22	11.76	15.09	18.60
	2[c]	1	7.71	9.80	13.15	16.24
		3	11.88	12.88	16.06	19.78
		15	7.80	8.53	11.70	15.33
	Exp. 2 Mean		9.13	10.40	13.64	17.12
	Overall Mean		9.18	11.18	14.47	17.96
L. reuteri DS-36	1[b]	2	7.53	9.89	12.97	15.88
		8	8.44	11.61	15.24	19.32
		14	10.43	14.33	18.51	22.41
	Exp. 1 Mean		8.80	11.94	15.57	19.20
	2[c]	2	11.43	13.88	17.33	20.50
		4	10.52	12.25	15.88	20.23
		10	5.90	7.17	9.98	13.79
	Exp. 2 Mean		9.28	11.10	14.39	18.17
	Overall Mean		9.01	11.58	15.07	18.76
L. reuteri DS-37	1[b]	4	7.94	11.79	15.42	18.42
		6	9.16	12.34	15.33	19.78
		11	9.71	12.88	15.51	19.05
	Exp. 1 Mean		8.94	12.34	15.42	19.08
	2[c]	5	11.07	11.79	13.88	16.87
		6	7.80	8.44	11.88	14.61
		11	9.25	10.66	13.34	16.24
	Exp. 2 Mean		9.37	10.30	13.03	15.91
	Overall Mean		9.12	11.46	14.40	17.72
L. reuteri WB-72	1[b]	3	8.89	11.79	14.97	18.60
		7	8.89	12.25	15.69	19.50
		15	8.71	10.89	14.06	16.51
	Exp. 1 Mean		8.83	11.64	14.91	18.20
	2[c]	7	11.25	13.20	16.87	19.96
		8	7.17	8.16	10.98	14.61
		9	9.07	10.52	13.43	16.51
	Exp. 2 Mean		9.16	10.63	13.76	17.02
	Overall Mean		8.97	11.21	14.42	17.70
L. reuteri WB-76	1[b]	1	8.26	10.80	13.97	17.69
		9	8.98	11.61	14.79	17.51
		12	10.07	14.06	17.24	20.96
	Exp. 1 Mean		9.10	12.16	15.33	18.72
	2[c]	12	10.52	11.70	14.97	17.96
		13	9.98	11.34	14.83	18.51
		14	7.80	9.53	13.52	17.33
	Exp. 2 Mean		9.43	10.86	14.44	17.93
	Overall Mean		9.24	11.60	14.95	18.38

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C4. Study 2 weekly ADG[a] (kg)

Treatment[b]	Exp.[b]	Pig[b]	Week 1	Week 2	Week 3
Control	1[c]	5	0.27	0.41	0.80
		10	0.34	0.56	0.65
		13	0.34	0.45	0.65
	Exp. 1 Mean		0.32	0.48	0.70
	2[d]	1	0.30	0.48	0.39
		3	0.14	0.45	0.46
		15	0.10	0.45	0.45
	Exp. 2 Mean		0.18	0.46	0.43
	Overall Mean		0.25	0.47	0.57
L. reuteri DS-36	1[c]	2	0.29	0.44	0.58
		8	0.40	0.52	0.82
		14	0.49	0.60	0.78
	Exp. 1 Mean		0.39	0.52	0.73
	2[d]	2	0.35	0.49	0.40
		4	0.25	0.52	0.54
		10	0.18	0.40	0.48
	Exp. 2 Mean		0.26	0.47	0.47
	Overall Mean		0.33	0.49	0.60
L. reuteri DS-37	1[c]	4	0.48	0.52	0.60
		6	0.40	0.43	0.89
		11	0.40	0.38	0.71
	Exp. 1 Mean		0.43	0.44	0.73
	2[d]	5	0.10	0.30	0.37
		6	0.09	0.49	0.34
		11	0.20	0.38	0.36
	Exp. 2 Mean		0.13	0.39	0.36
	Overall Mean		0.28	0.42	0.55
L. reuteri WB-72	1[c]	3	0.36	0.45	0.73
		7	0.42	0.49	0.76
		15	0.27	0.45	0.49
	Exp. 1 Mean		0.35	0.47	0.66
	2[d]	7	0.28	0.52	0.39
		8	0.14	0.40	0.45
		9	0.21	0.41	0.39
	Exp. 2 Mean		0.21	0.45	0.41
	Overall Mean		0.28	0.46	0.53
L. reuteri WB-76	1[c]	1	0.32	0.45	0.74
		9	0.33	0.45	0.54
		12	0.50	0.45	0.74
	Exp. 1 Mean		0.38	0.45	0.68
	2[d]	12	0.17	0.47	0.37
		13	0.19	0.50	0.46
		14	0.25	0.57	0.48
	Exp. 2 Mean		0.20	0.51	0.44
	Overall Mean		0.29	0.48	0.56

[a]ADG - average daily gain

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C5. Study 2 weekly ADFI[a] (kg)

Treatment[b]	Exp.[b]	Pig[b]	Week 1	Week 2	Week 3
Control	1[c]	5	0.46	0.74	1.20
		10	0.58	0.89	1.20
		13	0.56	0.76	1.19
	Exp. 1 Mean		0.53	0.79	1.20
	2[d]	1	0.42	0.68	0.69
		3	0.36	0.69	0.73
		15	0.26	0.63	0.69
	Exp. 2 Mean		0.35	0.67	0.70
	Overall Mean		0.44	0.73	0.95
L. reuteri DS-36	1[c]	2	0.55	0.71	1.02
		8	0.72	0.86	1.38
		14	0.82	0.95	1.34
	Exp. 1 Mean		0.70	0.84	1.25
	2[d]	2	0.55	0.80	0.72
		4	0.48	0.71	0.71
		10	0.34	0.63	0.72
	Exp. 2 Mean		0.46	0.72	0.72
	Overall Mean		0.58	0.78	0.98
L. reuteri DS-37	1[c]	4	0.70	0.85	1.07
		6	0.63	0.78	1.30
		11	0.71	0.72	1.14
	Exp. 1 Mean		0.68	0.78	1.17
	2[d]	5	0.33	0.55	0.57
		6	0.38	0.54	0.66
		11	0.44	0.60	0.64
	Exp. 2 Mean		0.38	0.56	0.62
	Overall Mean		0.53	0.67	0.90
L. reuteri WB-72	1[c]	3	0.70	0.81	1.23
		7	0.74	0.82	1.25
		15	0.47	0.73	1.03
	Exp. 1 Mean		0.63	0.79	1.17
	2[d]	7	0.52	0.70	0.69
		8	0.22	0.58	0.70
		9	0.36	0.52	0.70
	Exp. 2 Mean		0.37	0.60	0.70
	Overall Mean		0.50	0.69	0.93
L. reuteri WB-76	1[c]	1	0.62	0.73	1.30
		9	0.66	0.76	1.07
		12	0.73	0.86	1.17
	Exp. 1 Mean		0.67	0.79	1.18
	2[d]	12	0.32	0.69	0.69
		13	0.37	0.72	0.69
		14	0.41	0.71	0.71
	Exp. 2 Mean		0.37	0.71	0.70
	Overall Mean		0.52	0.75	0.94

[a]ADFI - average daily feed intake

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C6. Study 2 weekly F:G ratio[a]

Treatment[b]	Exp.[b]	Pig[b]	Week 1	Week 2	Week 3
Control	1[c]	5	1.67	1.77	1.50
		10	1.70	1.60	1.84
		13	1.66	1.67	1.83
	Exp. 1 Mean		1.68	1.68	1.72
	2[d]	1	1.42	1.41	1.79
		3	2.55	1.52	1.57
		15	2.46	1.39	1.52
	Exp. 2 Mean		2.14	1.44	1.63
	Overall Mean		1.91	1.56	1.68
L. reuteri DS-36	1[c]	2	1.88	1.61	1.76
		8	1.82	1.66	1.69
		14	1.68	1.59	1.72
	Exp. 1 Mean		1.79	1.62	1.72
	2[d]	2	1.57	1.63	1.82
		4	1.95	1.37	1.30
		10	1.86	1.57	1.51
	Exp. 2 Mean		1.79	1.52	1.54
	Overall Mean		1.79	1.57	1.63
L. reuteri DS-37	1[c]	4	1.44	1.65	1.79
		6	1.59	1.81	1.46
		11	1.79	1.92	1.61
	Exp. 1 Mean		1.61	1.79	1.62
	2[d]	5	3.17	1.83	1.51
		6	4.20	1.10	1.93
		11	2.20	1.56	1.75
	Exp. 2 Mean		3.19	1.50	1.73
	Overall Mean		2.40	1.65	1.68
L. reuteri WB-72	1[c]	3	1.92	1.79	1.69
		7	1.75	1.67	1.64
		15	1.73	1.61	2.09
	Exp. 1 Mean		1.80	1.69	1.81
	2[d]	7	1.88	1.33	1.78
		8	1.52	1.44	1.55
		9	1.71	1.61	2.09
	Exp. 2 Mean		1.70	1.46	1.81
	Overall Mean		1.75	1.58	1.81
L. reuteri WB-76	1[c]	1	1.94	1.61	1.74
		9	2.00	1.68	1.96
		12	1.45	1.90	1.57
	Exp. 1 Mean		1.80	1.73	1.76
	2[d]	12	1.88	1.49	1.86
		13	1.88	1.45	1.51
		14	1.68	1.25	1.49
	Exp. 2 Mean		1.81	1.40	1.62
	Overall Mean		1.81	1.56	1.69

[a]F:G - feed to gain

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C7. Study 2 overall growth and performance (kg)

Treatment[a]	Exp.[a]	Pig[a]	ADG[b]	ADFI[c]	F:G[d]
Control	1[e]	5	0.50	0.80	1.63
		10	0.52	0.89	1.71
		13	0.48	0.84	1.72
	Exp. 1 Mean		0.50	0.84	1.69
	2[f]	1	0.39	0.60	1.55
		3	0.35	0.59	1.67
		15	0.34	0.53	1.56
	Exp. 2 Mean		0.36	0.57	1.59
	Overall Mean		0.43	0.71	1.64
L. reuteri DS-36	1[e]	2	0.44	0.76	1.74
		8	0.58	0.99	1.72
		14	0.62	1.03	1.66
	Exp. 1 Mean		0.55	0.93	1.71
	2[f]	2	0.41	0.69	1.68
		4	0.44	0.63	1.44
		10	0.35	0.56	1.59
	Exp. 2 Mean		0.40	0.63	1.57
	Overall Mean		0.47	0.78	1.64
L. reuteri DS-37	1[e]	4	0.53	0.87	1.61
		6	0.57	0.90	1.60
		11	0.49	0.86	1.76
	Exp. 1 Mean		0.53	0.88	1.66
	2[f]	5	0.26	0.48	1.83
		6	0.31	0.53	1.72
		11	0.32	0.56	1.77
	Exp. 2 Mean		0.29	0.52	1.77
	Overall Mean		0.41	0.70	1.72
L. reuteri WB-72	1[e]	3	0.51	0.91	1.79
		7	0.56	0.93	1.68
		15	0.41	0.74	1.80
	Exp. 1 Mean		0.49	0.86	1.76
	2[f]	7	0.40	0.64	1.61
		8	0.33	0.50	1.51
		9	0.34	0.52	1.57
	Exp. 2 Mean		0.35	0.55	1.56
	Overall Mean		0.42	0.71	1.66
L. reuteri WB-76	1[e]	1	0.50	0.88	1.75
		9	0.44	0.83	1.87
		12	0.57	0.92	1.62
	Exp. 1 Mean		0.50	0.88	1.75
	2[f]	12	0.34	0.57	1.70
		13	0.38	0.59	1.55
		14	0.43	0.61	1.42
	Exp. 2 Mean		0.38	0.59	1.56
	Overall Mean		0.44	0.73	1.65

[a]Description of treatments, experiments, and pigs - see Table C2

[b]ADG - average daily gain

[c]ADFI - average daily feed intake

[d]F:G - feed to gain ratio

[e]Experiment 1 were gilts

[f]Experiment 2 were barrows

Table C8. Study 2 weekly fecal counts of coliforms[a] (Log_{10} cfu/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	7.65	5.76	3.85	5.53
		10	7.23	5.49	6.49	6.28
		13	6.80	7.38	6.08	4.43
	Exp. 1 Mean		7.23	6.21	5.47	5.41
	2[d]	1	4.20	4.20	4.00	5.28
		3	7.20	6.78	8.60	6.34
		15	8.04	6.96	6.43	6.68
	Exp. 2 Mean		6.48	5.98	6.34	6.10
	Overall Mean		6.86	6.10	5.91	5.76
L. reuteri DS-36	1[c]	2	7.20	6.59	5.95	4.38
		8	8.65	6.20	5.52	6.87
		14	6.80	6.52	7.46	5.83
	Exp. 1 Mean		7.55	6.44	6.31	5.69
	2[d]	2	6.77	4.95	5.71	7.11
		4	7.89	7.75	6.58	5.78
		10	8.18	7.40	7.34	7.79
	Exp. 2 Mean		7.61	6.70	6.54	6.89
	Overall Mean		7.58	6.57	6.43	6.29
L. reuteri DS-37	1[c]	4	6.18	6.00	5.23	7.36
		6	6.18	5.53	6.85	4.54
		11	7.30	7.53	5.53	6.11
	Exp. 1 Mean		6.55	6.35	5.87	6.01
	2[d]	5	5.73	7.71	7.62	8.65
		6	7.96	7.76	6.08	8.26
		11	6.60	6.72	6.80	6.81
	Exp. 2 Mean		6.76	7.40	6.83	7.91
	Overall Mean		6.66	6.88	6.35	6.96
L. reuteri WB-72	1[c]	3	8.79	6.32	7.59	5.48
		7	5.53	7.79	6.36	3.45
		15	6.08	6.71	4.61	6.38
	Exp. 1 Mean		6.80	6.94	6.19	5.10
	2[d]	7	8.23	6.85	6.15	6.41
		8	6.91	9.04	7.08	8.18
		9	7.00	8.15	6.08	5.81
	Exp. 2 Mean		7.38	8.01	6.43	6.80
	Overall Mean		7.09	7.47	6.31	5.95
L. reuteri WB-76	1[c]	1	6.59	8.11	7.57	6.38
		9	7.57	5.75	5.11	7.54
		12	7.49	5.48	6.08	6.45
	Exp. 1 Mean		7.22	6.45	6.25	6.79
	2[d]	12	5.72	6.71	4.20	6.58
		13	7.89	7.04	6.49	7.85
		14	5.85	6.61	6.28	5.89
	Exp. 2 Mean		6.49	6.79	5.66	6.77
	Overall Mean		6.85	6.62	5.96	6.78

[a]Plated on violet red bile agar (VRBA)

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C9. Study 2 weekly fecal counts of lactobacilli[a] (Log_{10} cfu/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	9.72	9.40	10.23	9.59
		10	9.98	9.40	9.74	9.53
		13	9.72	9.58	9.96	9.97
	Exp. 1 Mean		9.81	9.46	9.98	9.70
	2[d]	1	8.11	9.53	9.72	10.00
		3	9.75	9.70	10.11	9.72
		15	9.76	9.68	10.04	9.38
	Exp. 2 Mean		9.21	9.64	9.96	9.70
	Overall Mean		9.51	9.55	9.97	9.70
L. reuteri DS-36	1[c]	2	8.99	9.11	8.93	9.04
		8	9.57	9.11	9.92	9.43
		14	9.81	9.36	9.11	9.41
	Exp. 1 Mean		9.46	9.20	9.32	9.30
	2[d]	2	9.83	9.51	9.99	9.28
		4	9.15	9.65	9.93	9.67
		10	9.64	9.15	9.79	8.62
	Exp. 2 Mean		9.54	9.43	9.90	9.19
	Overall Mean		9.50	9.32	9.61	9.24
L. reuteri DS-37	1[c]	4	9.04	9.40	9.59	9.89
		6	9.54	9.40	9.86	9.64
		11	9.76	8.94	9.56	9.41
	Exp. 1 Mean		9.45	9.25	9.67	9.65
	2[d]	5	9.81	9.54	9.74	8.41
		6	9.49	9.08	9.65	9.79
		11	9.89	9.56	10.00	9.58
	Exp. 2 Mean		9.73	9.39	9.80	9.26
	Overall Mean		9.59	9.32	9.73	9.45
L. reuteri WB-72	1[c]	3	9.81	9.51	9.36	9.40
		7	9.28	8.89	9.49	9.11
		15	9.48	9.04	9.51	9.72
	Exp. 1 Mean		9.52	9.14	9.45	9.41
	2[d]	7	9.92	10.11	9.76	9.45
		8	10.15	9.88	9.86	9.58
		9	9.65	9.69	9.26	9.89
	Exp. 2 Mean		9.91	9.89	9.62	9.64
	Overall Mean		9.71	9.52	9.54	9.52
L. reuteri WB-76	1[c]	1	9.77	9.66	8.15	9.38
		9	10.00	9.68	9.89	9.52
		12	9.40	9.15	9.53	9.51
	Exp. 1 Mean		9.72	9.50	9.19	9.47
	2[d]	12	10.18	9.38	9.26	9.89
		13	9.38	9.34	9.11	9.97
		14	9.98	9.43	9.98	9.60
	Exp. 2 Mean		9.84	9.38	9.45	9.82
	Overall Mean		9.78	9.44	9.32	9.64

[a]Plated on *Lactobacillus* selection agar (LBSA)

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C10. Study 2 weekly fecal counts of *Campylobacter* [a] (Log_{10} cfu/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	4.08	5.74	4.59	4.53
		10	4.41	4.34	4.80	5.49
		13	5.66	6.04	5.81	5.68
	Exp. 1 Mean		5.37	5.07	5.07	5.23
	2[d]	1	4.00	4.46	4.00	4.00
		3	4.00	4.48	4.00	4.00
		15	4.45	4.00	4.48	4.43
	Exp. 2 Mean		4.15	4.31	4.16	4.14
	Overall Mean		4.43	4.84	4.61	4.69
L. reuteri DS-36	1[c]	2	4.00	4.00	4.45	4.00
		8	4.38	4.67	4.00	4.38
		14	4.38	4.00	4.74	4.00
	Exp. 1 Mean		4.25	4.22	4.40	4.13
	2[d]	2	4.00	4.00	4.00	4.00
		4	4.59	4.00	4.00	4.00
		10	6.04	4.51	6.08	4.57
	Exp. 2 Mean		4.88	4.17	4.69	4.19
	Overall Mean		4.57	4.20	4.55	4.16
L. reuteri DS-37	1[c]	4	4.00	4.41	5.34	4.00
		6	4.74	4.00	4.00	4.00
		11	4.00	5.69	4.67	4.66
	Exp. 1 Mean		4.56	4.25	4.18	4.85
	2[d]	5	4.00	4.00	4.38	4.77
		6	4.00	4.00	4.30	4.64
		11	4.00	4.00	4.74	5.48
	Exp. 2 Mean		4.32	4.23	4.56	5.15
	Overall Mean		4.44	4.24	4.37	5.00
L. reuteri WB-72	1[c]	3	4.00	4.00	4.67	5.54
		7	5.90	5.58	4.45	4.54
		15	4.00	4.11	4.79	5.79
	Exp. 1 Mean		4.63	4.56	4.64	5.29
	2[d]	7	4.00	4.00	4.00	4.00
		8	4.00	4.51	4.00	4.53
		9	7.34	4.00	4.34	4.38
	Exp. 2 Mean		5.11	4.17	4.11	4.30
	Overall Mean		4.87	4.37	4.38	4.80
L. reuteri WB-76	1[c]	1	4.64	4.00	4.00	4.00
		9	4.45	4.00	4.00	6.08
		12	4.58	4.75	4.54	4.46
	Exp. 1 Mean		4.56	4.25	4.18	4.85
	2[d]	12	4.41	4.00	5.68	6.18
		13	4.48	4.68	4.00	4.68
		14	4.08	4.00	4.00	4.59
	Exp. 2 Mean		4.32	4.23	4.56	5.15
	Overall Mean		4.44	4.24	4.37	5.00

[a]Testing was done on the Bax® system

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C11. Study 2 testing of weekly fecal cultures of *Campylobacter* positives[a]

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	+	+	+	+
		10	+	+	+	+
		13	+	+	+	+
		Exp. 1 Mean	3	3	3	3
	2[d]	1	-	+	-	-
		3	-	+	-	-
		15	+	-	+	+
		Exp. 2 Mean	1	1	1	1
		Overall Mean	4	5	4	4
L. reuteri DS-36	1[c]	2	-	-	+	-
		8	+	+	-	+
		14	+	-	+	-
		Exp. 1 Mean	2	1	2	1
	2[d]	2	-	-	-	-
		4	+	-	-	-
		10	+	+	+	+
		Exp. 2 Mean	2	1	1	1
		Overall Mean	4	2	3	2
L. reuteri DS-37	1[c]	4	-	+	+	-
		6	+	-	-	-
		11	-	+	+	+
		Exp. 1 Mean	1	2	2	1
	2[d]	5	-	-	+	+
		6	-	-	+	+
		11	-	+	+	+
		Exp. 2 Mean	0	1	3	3
		Overall Mean	1	3	5	4
L. reuteri WB-72	1[c]	3	-	+	+	+
		7	+	+	+	+
		15	-	+	+	+
		Exp. 1 Mean	1	3	3	3
	2[d]	7	+	-	-	-
		8	-	+	-	+
		9	+	-	+	+
		Exp. 2 Mean	2	1	1	2
		Overall Mean	3	4	4	5
L. reuteri WB-76	1[c]	1	+	-	-	-
		9	+	-	-	+
		12	+	+	+	+
		Exp. 1 Mean	3	1	1	2
	2[d]	12	+	-	+	+
		13	+	+	-	+
		14	+	-	-	+
		Exp. 2 Mean	3	1	1	3
		Overall Mean	6	2	2	5

[a]Testing was done on the Bax® system

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C12. Study 2 testing of weekly fecal enrichment cultures of *Campylobacter* positives[a]

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	+	+	+	+
		10	+	+	+	+
		13	+	+	+	+
		Exp. 1 Mean	3	3	3	3
	2[d]	1	+	+	-	-
		3	-	+	+	+
		15	+	+	+	+
		Exp. 2 Mean	2	3	2	2
		Overall Mean	5	6	5	5
L. reuteri DS-36	1[c]	2	+	+	+	+
		8	+	+	+	+
		14	+	+	+	+
		Exp. 1 Mean	3	3	3	3
	2[d]	2	+	+	-	+
		4	+	+	-	+
		10	+	+	+	+
		Exp. 2 Mean	3	3	1	3
		Overall Mean	6	6	4	6
L. reuteri DS-37	1[c]	4	+	+	+	+
		6	+	+	+	+
		11	+	+	+	+
		Exp. 1 Mean	3	3	3	3
	2[d]	5	+	+	+	+
		6	+	+	+	+
		11	-	+	+	+
		Exp. 2 Mean	2	3	3	3
		Overall Mean	5	6	6	6
L. reuteri WB-72	1[c]	3	+	+	+	+
		7	+	+	+	+
		15	+	+	+	+
		Exp. 1 Mean	3	3	3	3
	2[d]	7	+	+	+	+
		8	+	+	+	+
		9	+	-	+	+
		Exp. 2 Mean	3	2	3	3
		Overall Mean	6	5	6	6
L. reuteri WB-76	1[c]	1	+	+	+	+
		9	+	+	+	+
		12	+	+	+	+
		Exp. 1 Mean	3	3	3	3
	2[d]	12	+	+	+	+
		13	+	+	+	+
		14	+	+	-	+
		Exp. 2 Mean	3	3	2	3
		Overall Mean	6	6	5	6

[a]Testing was done on the Bax® system

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C13. Study 2 testing of weekly fecal enrichment cultures of *Salmonella* positives[a]

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	-	-	-	-
		10	-	-	-	-
		13	-	-	-	-
	Exp. 1 Mean		0	0	0	0
	2[d]	1	-	-	-	-
		3	-	-	-	-
		15	-	-	-	-
	Exp. 2 Mean		0	0	0	0
	Overall Mean		0	0	0	0
L. reuteri DS-36	1[c]	2	-	-	-	-
		8	-	-	-	-
		14	-	-	-	-
	Exp. 1 Mean		0	0	0	0
	2[d]	2	-	-	-	-
		4	+	-	-	-
		10	-	-	-	-
	Exp. 2 Mean		1	0	0	0
	Overall Mean		1	0	0	0
L. reuteri DS-37	1[c]	4	-	-	-	-
		6	-	-	-	-
		11	-	-	-	-
	Exp. 1 Mean		0	0	0	0
	2[d]	5	-	-	-	-
		6	-	-	-	-
		11	-	-	-	-
	Exp. 2 Mean		0	0	0	0
	Overall Mean		0	0	0	0
L. reuteri WB-72	1[c]	3	-	-	-	-
		7	-	-	-	-
		15	-	-	-	-
	Exp. 1 Mean		0	0	0	0
	2[d]	7	-	-	-	-
		8	-	-	-	-
		9	-	-	-	-
	Exp. 2 Mean		0	0	0	0
	Overall Mean		0	0	0	0
L. reuteri WB-76	1[c]	1	-	-	-	-
		9	+	+	-	+
		12	-	-	-	-
	Exp. 1 Mean		1	1	0	1
	2[d]	12	-	-	-	-
		13	-	-	-	-
		14	-	-	-	-
	Exp. 2 Mean		0	0	0	0
	Overall Mean		1	1	0	1

[a]Testing was done on the Bax® system

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C14. Study 2 experiment 2 testing of weekly fecal enrichment cultures of *Escherichia coli* O157:H7 positives[a]

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	2[c]	1	-	-	-	-
		3	-	-	-	-
		15	-	-	-	-
		Mean	0	0	0	0
L. reuteri DS-36	2[c]	2	-	-	-	-
		4	-	-	-	-
		10	-	-	-	-
		Mean	0	0	0	0
L. reuteri DS-37	2[c]	5	-	-	-	-
		6	-	-	-	-
		11	-	-	-	-
		Mean	0	0	0	0
L. reuteri WB-72	2[c]	7	-	-	-	-
		8	-	-	-	-
		9	-	-	-	-
		Mean	0	0	0	0
L. reuteri WB-76	2[c]	12	-	-	-	-
		13	-	-	-	-
		14	-	-	-	-
		Mean	0	0	0	0

[a]Testing was done on the Bax® system

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 2 were barrows

Table C15. Study 2 weekly glucose levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	111	109	100	136
		10	109	121	119	137
		13	130	93	99	108
	Exp. 1 Mean		117	108	106	127
	2[c]	1	98	95	109	102
		3	87	84	120	86
		15	93	91	114	106
	Exp. 2 Mean		93	90	114	98
	Overall Mean		105	99	110	113
L. reuteri DS-36	1[b]	2	121	104	100	108
		8	99	98	106	116
		14	104	103	105	108
	Exp. 1 Mean		108	102	104	111
	2[c]	2	97	91	115	98
		4	103	95	122	111
		10	128	93	114	101
	Exp. 2 Mean		109	93	117	103
	Overall Mean		109	97	110	107
L. reuteri DS-37	1[b]	4	118	124	136	132
		6	126	113	98	127
		11	110	110	99	126
	Exp. 1 Mean		118	116	111	128
	2[c]	5	90	76	145	99
		6	100	101	104	102
		11	168	105	121	109
	Exp. 2 Mean		119	94	123	103
	Overall Mean		119	105	117	116
L. reuteri WB-72	1[b]	3	158	125	115	118
		7	109	107	96	116
		15	113	93	111	103
	Exp. 1 Mean		127	108	107	112
	2[c]	7	102	107	127	117
		8	91	88	109	97
		9	98	86	113	94
	Exp. 2 Mean		97	94	116	103
	Overall Mean		112	101	112	108
L. reuteri WB-76	1[b]	1	166	106	107	129
		9	119	117	115	117
		12	114	119	113	116
	Exp. 1 Mean		133	114	112	121
	2[c]	12	101	94	131	102
		13	116	87	134	106
		14	103	90	121	101
	Exp. 2 Mean		107	90	129	103
	Overall Mean		120	102	120	112

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C16. Study 2 weekly BUN[a] levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	11	7	8	9
		10	13	10	12	10
		13	9	9	8	7
	Exp. 1 Mean		11	9	9	9
	2[d]	1	7	9	8	6
		3	7	7	8	6
		15	10	9	8	10
	Exp. 2 Mean		8	8	8	7
	Overall Mean		10	9	9	8
L. reuteri DS-36	1[c]	2	10	10	9	8
		8	15	11	10	9
		14	10	11	9	10
	Exp. 1 Mean		12	11	9	9
	2[d]	2	8	8	11	9
		4	8	6	9	10
		10	4	5	6	6
	Exp. 2 Mean		7	6	9	8
	Overall Mean		9	9	9	9
L. reuteri DS-37	1[c]	4	12	11	9	9
		6	8	8	8	11
		11	11	13	12	13
	Exp. 1 Mean		10	11	10	11
	2[d]	5	7	5	6	6
		6	6	5	7	7
		11	9	10	11	16
	Exp. 2 Mean		7	7	8	10
	Overall Mean		9	9	9	10
L. reuteri WB-72	1[c]	3	9	9	7	9
		7	11	10	10	10
		15	11	12	10	11
	Exp. 1 Mean		10	10	9	10
	2[d]	7	9	7	7	10
		8	7	9	7	7
		9	10	8	9	7
	Exp. 2 Mean		9	8	8	8
	Overall Mean		10	9	8	9
L. reuteri WB-76	1[c]	1	8	8	9	11
		9	10	11	11	12
		12	11	11	10	12
	Exp. 1 Mean		10	10	10	12
	2[d]	12	6	5	11	6
		13	9	4	10	8
		14	9	9	9	12
	Exp. 2 Mean		8	6	10	9
	Overall Mean		9	8	10	10

[a]BUN - blood urea nitrogen

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C17. Study 2 weekly creatinine levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	0.9	0.9	0.9	1.0
		10	1.0	1.0	1.0	1.0
		13	0.9	1.2	1.1	1.0
	Exp. 1 Mean		0.9	1.0	1.0	1.0
	2[c]	1	1.3	1.1	1.1	1.1
		3	1.3	1.3	1.4	1.3
		15	1.2	1.3	1.1	1.3
	Exp. 2 Mean		1.3	1.2	1.2	1.2
	Overall Mean		1.1	1.1	1.1	1.1
L. reuteri DS-36	1[b]	2	0.8	1.0	0.9	0.9
		8	1.0	1.0	0.9	1.1
		14	1.0	1.1	1.0	1.0
	Exp. 1 Mean		0.9	1.0	0.9	1.0
	2[c]	2	1.2	1.2	1.4	1.3
		4	1.1	1.1	1.3	1.2
		10	1.0	0.8	0.8	0.9
	Exp. 2 Mean		1.1	1.0	1.2	1.1
	Overall Mean		1.0	1.0	1.1	1.1
L. reuteri DS-37	1[b]	4	0.9	1.0	1.0	1.1
		6	0.9	0.8	0.9	0.9
		11	0.9	1.2	1.3	1.4
	Exp. 1 Mean		0.9	1.0	1.1	1.1
	2[c]	5	1.3	1.2	1.4	1.3
		6	1.2	1.2	1.3	1.4
		11	1.5	1.2	1.5	1.2
	Exp. 2 Mean		1.3	1.2	1.4	1.3
	Overall Mean		1.1	1.1	1.2	1.2
L. reuteri WB-72	1[b]	3	0.9	1.1	1.0	1.1
		7	1.0	1.0	1.0	1.0
		15	1.0	1.2	1.2	0.9
	Exp. 1 Mean		1.0	1.1	1.1	1.0
	2[c]	7	1.1	1.3	1.1	1.3
		8	1.0	1.1	1.0	0.9
		9	1.0	0.9	1.0	0.9
	Exp. 2 Mean		1.0	1.1	1.0	1.0
	Overall Mean		1.0	1.1	1.1	1.0
L. reuteri WB-76	1[b]	1	1.0	0.9	1.2	1.1
		9	1.0	1.1	1.1	1.2
		12	1.0	0.9	1.0	1.0
	Exp. 1 Mean		1.0	1.0	1.1	1.1
	2[c]	12	1.2	1.1	1.4	1.1
		13	1.3	0.8	1.2	1.1
		14	0.9	1.1	1.2	1.1
	Exp. 2 Mean		1.1	1.0	1.3	1.1
	Overall Mean		1.1	1.0	1.2	1.1

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C18. Study 2 weekly BUN[a]:creatinine ratio levels

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	12.0	7.8	8.2	9.2
		10	13.8	10.0	11.6	10.0
		13	10.1	7.8	6.9	6.6
	Exp. 1 Mean		12.0	8.5	8.9	8.6
	2[d]	1	5.6	7.9	7.1	5.8
		3	5.2	5.4	5.5	4.9
		15	7.8	6.9	7.4	7.8
	Exp. 2 Mean		6.2	6.7	6.7	6.2
	Overall Mean		9.1	7.6	7.8	7.4
L. reuteri DS-36	1[c]	2	12.2	10.6	9.6	8.4
		8	14.5	11.0	10.3	8.3
		14	10.2	10.1	9.0	9.7
	Exp. 1 Mean		12.3	10.6	9.6	8.8
	2[d]	2	6.7	6.4	7.7	7.2
		4	7.6	5.5	6.6	8.1
		10	4.0	6.3	7.4	7.0
	Exp. 2 Mean		6.1	6.1	7.2	7.4
	Overall Mean		9.2	8.3	8.4	8.1
L. reuteri DS-37	1[c]	4	14.1	11.4	9.1	8.0
		6	9.5	10.9	9.4	12.3
		11	12.3	10.8	9.1	9.7
	Exp. 1 Mean		12.0	11.0	9.2	10.0
	2[d]	5	5.2	4.1	4.2	4.8
		6	5.1	4.1	5.5	5.3
		11	5.8	8.3	7.6	13.2
	Exp. 2 Mean		5.4	5.5	5.8	7.8
	Overall Mean		8.7	8.3	7.5	8.9
L. reuteri WB-72	1[c]	3	10.7	8.3	7.1	7.9
		7	11.0	9.8	9.9	9.2
		15	10.8	9.8	8.4	12.2
	Exp. 1 Mean		10.8	9.3	8.5	9.8
	2[d]	7	7.5	5.3	6.3	7.2
		8	6.9	7.9	7.3	7.3
		9	10.1	8.8	8.8	7.7
	Exp. 2 Mean		8.2	7.3	7.5	7.4
	Overall Mean		9.5	8.3	8.0	8.6
L. reuteri WB-76	1[c]	1	8.2	9.2	7.9	10.5
		9	9.9	9.8	10.1	10.2
		12	11.1	12.3	10.1	11.5
	Exp. 1 Mean		9.7	10.4	9.4	10.7
	2[d]	12	5.1	4.8	7.8	5.5
		13	7.2	5.4	8.0	7.2
		14	9.5	8.4	7.6	10.6
	Exp. 2 Mean		7.3	6.2	7.8	7.8
	Overall Mean		8.5	8.3	8.6	9.3

[a]BUN - blood urea nitrogen

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C19. Study 2 weekly sodium levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	137	137	138	141
		10	137	137	140	139
		13	136	139	139	141
	Exp. 1 Mean		137	138	139	140
	2[c]	1	135	135	133	134
		3	141	142	159	140
		15	139	137	143	135
	Exp. 2 Mean		138	138	145	136
	Overall Mean		138	138	142	138
L. reuteri DS-36	1[b]	2	136	141	140	143
		8	135	138	137	140
		14	135	138	139	137
	Exp. 1 Mean		135	139	139	140
	2[c]	2	139	136	145	137
		4	137	138	156	139
		10	134	130	139	135
	Exp. 2 Mean		137	135	147	137
	Overall Mean		136	137	143	139
L. reuteri DS-37	1[b]	4	135	138	139	142
		6	137	137	138	140
		11	136	138	141	141
	Exp. 1 Mean		136	138	139	141
	2[c]	5	138	131	165	138
		6	137	134	143	133
		11	134	136	152	133
	Exp. 2 Mean		136	134	153	135
	Overall Mean		136	136	146	138
L. reuteri WB-72	1[b]	3	139	136	139	143
		7	141	137	137	139
		15	137	140	137	138
	Exp. 1 Mean		139	138	138	140
	2[c]	7	137	141	138	138
		8	135	136	137	139
		9	141	139	154	138
	Exp. 2 Mean		138	139	143	138
	Overall Mean		138	138	140	139
L. reuteri WB-76	1[b]	1	136	137	140	146
		9	138	138	139	142
		12	138	140	140	141
	Exp. 1 Mean		137	138	140	143
	2[c]	12	147	136	155	135
		13	144	119	160	136
		14	137	138	149	137
	Exp. 2 Mean		143	131	155	136
	Overall Mean		140	135	147	140

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C20. Study 2 weekly potassium levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	8.8	9.2	11.0	10.6
		10	8.5	9.3	9.2	10.7
		13	8.4	7.5	8.3	9.0
	Exp. 1 Mean		8.6	8.7	9.5	10.1
	2[c]	1	10.2	8.3	8.7	8.9
		3	11.2	9.2	9.4	9.9
		15	10.5	10.4	10.2	10.8
	Exp. 2 Mean		10.6	9.3	9.4	9.9
	Overall Mean		9.6	9.0	9.5	10.0
L. reuteri DS-36	1[b]	2	8.4	9.1	9.2	8.9
		8	9.1	8.7	8.3	8.8
		14	8.6	8.4	8.4	9.5
	Exp. 1 Mean		8.7	8.7	8.6	9.1
	2[c]	2	9.8	9.7	9.3	9.2
		4	13.1	9.3	10.9	9.3
		10	10.5	9.2	8.8	9.2
	Exp. 2 Mean		11.1	9.4	9.7	9.2
	Overall Mean		9.9	9.1	9.2	9.2
L. reuteri DS-37	1[b]	4	7.4	8.5	10.3	9.7
		6	7.2	8.0	9.8	9.7
		11	9.3	8.4	10.2	8.6
	Exp. 1 Mean		8.0	8.3	10.1	9.3
	2[c]	5	10.8	9.3	10.0	11.5
		6	11.2	11.3	9.4	9.3
		11	10.4	8.6	9.7	10.6
	Exp. 2 Mean		10.8	9.7	9.7	10.5
	Overall Mean		9.4	9.0	9.9	9.9
L. reuteri WB-72	1[b]	3	9.1	8.7	10.4	10.0
		7	9.7	8.2	9.4	9.0
		15	9.2	8.9	9.9	9.5
	Exp. 1 Mean		9.3	8.6	9.9	9.5
	2[c]	7	10.2	9.9	8.7	10.2
		8	12.0	10.2	9.3	10.3
		9	9.5	9.7	10.1	10.2
	Exp. 2 Mean		10.6	9.9	9.4	10.2
	Overall Mean		10.0	9.3	9.6	9.9
L. reuteri WB-76	1[b]	1	9.6	9.0	10.6	10.4
		9	9.2	9.2	10.4	11.3
		12	7.4	7.2	9.4	8.0
	Exp. 1 Mean		8.7	8.5	10.1	9.9
	2[c]	12	10.4	10.1	10.5	11.5
		13	11.9	9.5	9.6	10.5
		14	9.4	8.0	8.8	8.8
	Exp. 2 Mean		10.6	9.2	9.6	10.3
	Overall Mean		9.7	8.8	9.9	10.1

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C21. Study 2 weekly chloride levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	100	103	104	105
		10	103	106	106	107
		13	98	102	101	102
	Exp. 1 Mean		100	104	104	105
	2[c]	1	101	102	101	99
		3	107	105	118	104
		15	101	103	105	102
	Exp. 2 Mean		103	103	108	102
	Overall Mean		102	104	106	103
L. reuteri DS-36	1[b]	2	102	104	103	102
		8	100	104	101	101
		14	97	102	100	102
	Exp. 1 Mean		100	103	101	102
	2[c]	2	104	100	106	101
		4	105	105	117	105
		10	100	99	105	100
	Exp. 2 Mean		103	101	109	102
	Overall Mean		101	102	105	102
L. reuteri DS-37	1[b]	4	99	103	106	105
		6	99	104	107	105
		11	101	102	106	104
	Exp. 1 Mean		100	103	106	105
	2[c]	5	102	97	121	104
		6	99	101	106	97
		11	102	102	112	103
	Exp. 2 Mean		101	100	113	101
	Overall Mean		100	102	110	103
L. reuteri WB-72	1[b]	3	103	101	104	103
		7	103	102	105	106
		15	99	104	102	103
	Exp. 1 Mean		102	102	104	104
	2[c]	7	102	108	104	103
		8	98	102	100	102
		9	104	103	111	101
	Exp. 2 Mean		101	104	105	102
	Overall Mean		102	103	104	103
L. reuteri WB-76	1[b]	1	99	105	103	107
		9	99	104	104	106
		12	99	103	106	103
	Exp. 1 Mean		99	104	104	105
	2[c]	12	109	101	114	103
		13	108	93	118	103
		14	103	105	111	101
	Exp. 2 Mean		107	100	114	102
	Overall Mean		103	102	109	104

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C22. Study 2 weekly carbon dioxide levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	27	25	18	25
		10	25	21	21	20
		13	27	27	28	26
	Exp. 1 Mean		26	24	22	24
	2[c]	1	24	23	23	28
		3	24	25	27	23
		15	25	22	27	25
	Exp. 2 Mean		24	23	26	25
	Overall Mean		25	24	24	25
L. reuteri DS-36	1[b]	2	22	25	23	25
		8	24	24	26	30
		14	27	24	29	24
	Exp. 1 Mean		24	24	26	26
	2[c]	2	23	26	26	26
		4	20	24	24	23
		10	19	25	26	27
	Exp. 2 Mean		21	25	25	25
	Overall Mean		23	25	26	26
L. reuteri DS-37	1[b]	4	28	25	18	26
		6	30	25	22	25
		11	26	28	24	24
	Exp. 1 Mean		28	26	21	25
	2[c]	5	24	24	32	21
		6	26	20	27	26
		11	14	24	29	23
	Exp. 2 Mean		21	23	29	23
	Overall Mean		25	24	25	24
L. reuteri WB-72	1[b]	3	22	26	22	27
		7	26	25	21	24
		15	26	22	23	24
	Exp. 1 Mean		25	24	22	25
	2[c]	7	24	20	19	24
		8	26	26	27	25
		9	23	26	31	27
	Exp. 2 Mean		24	24	26	25
	Overall Mean		25	24	24	25
L. reuteri WB-76	1[b]	1	21	24	23	29
		9	27	25	23	25
		12	26	27	25	26
	Exp. 1 Mean		25	25	24	27
	2[c]	12	26	26	30	23
		13	25	20	31	26
		14	24	26	28	28
	Exp. 2 Mean		25	24	30	26
	Overall Mean		25	25	27	26

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C23. Study 2 weekly anion gap levels

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	19.2	17.6	26.6	21.6
		10	17.7	19.7	22.7	21.7
		13	19.5	17.7	19.0	21.8
	Exp. 1 Mean		18.8	18.3	22.8	21.7
	2[c]	1	19.8	18.0	17.7	15.8
		3	21.6	21.6	23.6	22.9
		15	23.4	21.7	21.4	20.0
	Exp. 2 Mean		21.6	20.4	20.9	19.6
	Overall Mean		20.2	19.4	21.8	20.6
L. reuteri DS-36	1[b]	2	20.0	20.7	22.6	24.2
		8	19.4	18.8	19.2	18.0
		14	19.7	19.5	18.4	20.6
	Exp. 1 Mean		19.7	19.7	20.1	20.9
	2[c]	2	21.3	18.9	22.6	19.6
		4	25.4	19.0	26.5	19.9
		10	24.9	15.6	17.4	17.1
	Exp. 2 Mean		23.9	17.8	22.2	18.9
	Overall Mean		21.8	18.8	21.1	19.9
L. reuteri DS-37	1[b]	4	15.0	19.4	25.2	21.2
		6	14.8	15.5	19.4	19.1
		11	18.4	16.3	21.5	21.0
	Exp. 1 Mean		16.1	17.1	22.0	20.4
	2[c]	5	23.8	18.9	21.1	25.1
		6	22.4	24.1	20.2	19.2
		11	28.5	17.8	20.4	17.6
	Exp. 2 Mean		24.9	20.3	20.6	20.6
	Overall Mean		20.5	18.7	21.3	20.5
L. reuteri WB-72	1[b]	3	23.2	17.9	23.2	23.1
		7	21.7	18.1	20.6	17.3
		15	21.9	22.2	22.7	19.9
	Exp. 1 Mean		22.3	19.4	22.2	20.1
	2[c]	7	21.4	22.6	23.3	20.5
		8	23.1	18.2	19.1	21.7
		9	24.0	20.1	22.7	21.3
	Exp. 2 Mean		22.8	20.3	21.7	21.2
	Overall Mean		22.6	19.9	21.9	20.6
L. reuteri WB-76	1[b]	1	24.4	18.0	23.9	20.8
		9	20.9	18.4	22.6	22.5
		12	20.5	17.1	18.9	20.3
	Exp. 1 Mean		21.9	17.8	21.8	21.2
	2[c]	12	22.5	18.8	21.7	20.9
		13	22.6	15.0	20.7	17.7
		14	19.4	14.5	19.4	16.8
	Exp. 2 Mean		21.5	16.1	20.6	18.5
	Overall Mean		21.7	17.0	21.2	19.8

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C24. Study 2 weekly calcium levels (mEq/L)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	10.6	10.4	10.0	10.3
		10	10.5	10.6	10.6	10.4
		13	10.8	10.7	9.8	9.9
	Exp. 1 Mean		10.6	10.6	10.1	10.2
	2[c]	1	9.8	10.1	10.6	10.4
		3	10.7	10.4	12.6	10.6
		15	10.7	9.9	10.7	10.8
	Exp. 2 Mean		10.4	10.1	11.3	10.6
	Overall Mean		10.5	10.4	10.7	10.4
L. reuteri DS-36	1[b]	2	9.8	10.5	10.4	10.2
		8	9.8	9.8	10.3	10.6
		14	10.8	10.9	10.2	9.8
	Exp. 1 Mean		10.1	10.4	10.3	10.2
	2[c]	2	10.9	10.9	11.6	10.8
		4	10.0	10.5	12.1	10.8
		10	10.0	9.6	10.5	10.3
	Exp. 2 Mean		10.3	10.3	11.4	10.6
	Overall Mean		10.2	10.4	10.9	10.4
L. reuteri DS-37	1[b]	4	10.6	10.8	10.4	10.7
		6	10.5	11.5	10.0	10.6
		11	10.1	10.0	9.9	10.1
	Exp. 1 Mean		10.4	10.8	10.1	10.5
	2[c]	5	10.7	9.0	12.3	10.5
		6	10.7	10.8	11.5	10.5
		11	9.6	10.4	11.9	10.2
	Exp. 2 Mean		10.3	10.1	11.9	10.4
	Overall Mean		10.4	10.4	11.0	10.4
L. reuteri WB-72	1[b]	3	10.5	10.6	10.0	10.6
		7	11.4	10.3	9.6	10.4
		15	10.5	10.1	10.2	9.9
	Exp. 1 Mean		10.8	10.3	9.9	10.3
	2[c]	7	10.9	10.5	10.5	10.7
		8	11.1	10.0	10.3	10.9
		9	10.6	10.0	11.9	10.8
	Exp. 2 Mean		10.9	10.2	10.9	10.8
	Overall Mean		10.8	10.3	10.4	10.6
L. reuteri WB-76	1[b]	1	10.7	10.4	10.1	11.1
		9	10.7	10.5	10.1	10.5
		12	10.5	10.1	9.9	10.3
	Exp. 1 Mean		10.6	10.3	10.0	10.6
	2[c]	12	11.2	10.3	11.9	10.9
		13	11.7	9.0	12.2	10.4
		14	10.9	10.6	11.6	11.0
	Exp. 2 Mean		11.3	10.0	11.9	10.8
	Overall Mean		11.0	10.2	11.0	10.7

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C25. Study 2 weekly total protein levels (g/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	4.1	4.3	4.7	5.2
		10	4.5	4.4	4.7	4.9
		13	4.6	4.7	4.8	5.2
	Exp. 1 Mean		4.4	4.5	4.7	5.1
	2[c]	1	4.8	4.2	4.5	4.6
		3	4.9	5.0	6.0	5.4
		15	4.8	4.9	5.1	5.0
	Exp. 2 Mean		4.8	4.7	5.2	5.0
	Overall Mean		4.6	4.6	5.0	5.1
L. reuteri DS-36	1[b]	2	4.5	4.7	5.1	5.4
		8	4.5	4.3	4.6	5.1
		14	4.8	4.5	4.9	5.2
	Exp. 1 Mean		4.6	4.5	4.9	5.2
	2[c]	2	5.1	5.2	5.6	5.4
		4	5.4	4.2	5.0	4.4
		10	4.8	4.3	4.5	4.8
	Exp. 2 Mean		5.1	4.6	5.0	4.9
	Overall Mean		4.9	4.5	5.0	5.1
L. reuteri DS-37	1[b]	4	4.1	4.3	4.9	5.1
		6	4.3	4.4	4.6	4.9
		11	4.2	4.6	4.8	4.9
	Exp. 1 Mean		4.2	4.4	4.8	5.0
	2[c]	5	5.1	4.4	5.9	5.4
		6	5.0	5.2	4.8	4.9
		11	4.2	4.8	5.8	4.8
	Exp. 2 Mean		4.8	4.8	5.5	5.0
	Overall Mean		4.5	4.6	5.1	5.0
L. reuteri WB-72	1[b]	3	4.8	4.8	5.0	5.6
		7	4.4	4.2	4.4	4.9
		15	4.6	4.8	4.8	4.8
	Exp. 1 Mean		4.6	4.6	4.7	5.1
	2[c]	7	5.2	5.2	5.0	5.3
		8	5.0	4.4	4.8	5.3
		9	4.6	4.7	5.7	5.3
	Exp. 2 Mean		4.9	4.8	5.2	5.3
	Overall Mean		4.8	4.7	5.0	5.2
L. reuteri WB-76	1[b]	1	4.6	4.3	4.6	5.3
		9	4.8	4.8	5.0	5.5
		12	4.7	4.8	5.1	5.3
	Exp. 1 Mean		4.7	4.6	4.9	5.4
	2[c]	12	5.2	4.8	6.0	5.9
		13	5.3	3.9	5.9	4.6
		14	4.0	3.9	4.9	4.8
	Exp. 2 Mean		4.8	4.2	5.6	5.1
	Overall Mean		4.8	4.4	5.3	5.2

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C26. Study 2 weekly albumin levels (g/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	2.5	2.4	2.9	3.1
		10	2.4	2.4	2.7	3.0
		13	2.8	2.6	2.6	2.9
	Exp. 1 Mean		2.6	2.5	2.7	3.0
	2[c]	1	2.4	2.1	2.4	2.6
		3	2.8	2.8	3.3	3.2
		15	2.5	2.8	3.0	3.1
	Exp. 2 Mean		2.6	2.6	2.9	3.0
	Overall Mean		2.6	2.5	2.8	3.0
L. reuteri DS-36	1[b]	2	2.7	3.0	3.3	3.3
		8	2.5	2.6	2.8	3.3
		14	2.8	2.9	3.4	3.6
	Exp. 1 Mean		2.7	2.8	3.2	3.4
	2[c]	2	2.9	3.0	3.3	3.1
		4	3.3	2.5	3.2	2.8
		10	2.4	2.2	2.6	3.1
	Exp. 2 Mean		2.9	2.6	3.0	3.0
	Overall Mean		2.8	2.7	3.1	3.2
L. reuteri DS-37	1[b]	4	2.5	3.0	3.4	3.6
		6	2.2	2.3	2.6	2.9
		11	2.5	2.6	2.8	2.9
	Exp. 1 Mean		2.4	2.6	2.9	3.1
	2[c]	5	2.8	2.2	3.1	3.1
		6	2.8	2.8	2.5	2.6
		11	2.2	2.5	2.9	2.4
	Exp. 2 Mean		2.6	2.5	2.8	2.7
	Overall Mean		2.5	2.6	2.9	2.9
L. reuteri WB-72	1[b]	3	3.1	3.0	3.4	3.6
		7	2.7	2.6	2.8	3.1
		15	2.6	2.8	2.5	2.6
	Exp. 1 Mean		2.8	2.8	2.9	3.1
	2[c]	7	3.1	3.1	3.0	3.4
		8	2.9	2.5	2.6	3.2
		9	2.9	2.6	3.1	3.2
	Exp. 2 Mean		3.0	2.7	2.9	3.3
	Overall Mean		2.9	2.8	2.9	3.2
L. reuteri WB-76	1[b]	1	2.6	2.3	2.8	3.3
		9	3.0	2.8	3.2	3.3
		12	2.8	2.8	3.0	3.2
	Exp. 1 Mean		2.8	2.6	3.0	3.3
	2[c]	12	3.0	2.6	3.8	3.5
		13	3.2	2.1	3.8	2.8
		14	2.4	2.3	3.0	3.0
	Exp. 2 Mean		2.9	2.3	3.5	3.1
	Overall Mean		2.8	2.5	3.3	3.2

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C27. Study 2 weekly globulin levels (g/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	1.7	1.9	1.8	2.1
		10	2.1	2.0	1.9	1.9
		13	1.8	2.2	2.2	2.3
	Exp. 1 Mean		1.9	2.0	2.0	2.1
	2[c]	1	2.4	2.1	2.2	2.0
		3	2.2	2.2	2.7	2.2
		15	2.2	2.1	2.1	1.9
	Exp. 2 Mean		2.3	2.1	2.3	2.0
	Overall Mean		2.1	2.1	2.2	2.1
L. reuteri DS-36	1[b]	2	1.8	1.6	1.8	2.1
		8	2.0	1.7	1.8	1.8
		14	1.9	1.7	1.6	1.6
	Exp. 1 Mean		1.9	1.7	1.7	1.8
	2[c]	2	2.2	2.3	2.3	2.3
		4	2.1	1.6	1.8	1.7
		10	2.4	2.1	1.9	1.7
	Exp. 2 Mean		2.2	2.0	2.0	1.9
	Overall Mean		2.1	1.8	1.9	1.9
L. reuteri DS-37	1[b]	4	1.6	1.3	1.5	1.6
		6	2.1	2.1	2.0	2.0
		11	1.7	2.0	2.1	2.0
	Exp. 1 Mean		1.8	1.8	1.9	1.9
	2[c]	5	2.3	2.2	2.8	2.3
		6	2.3	2.4	2.3	2.3
		11	1.9	2.3	2.9	2.4
	Exp. 2 Mean		2.2	2.3	2.7	2.3
	Overall Mean		2.0	2.1	2.3	2.1
L. reuteri WB-72	1[b]	3	1.8	1.8	1.6	2.0
		7	1.7	1.7	1.6	1.8
		15	2.0	2.0	2.2	2.2
	Exp. 1 Mean		1.8	1.8	1.8	2.0
	2[c]	7	2.1	2.1	2.0	1.9
		8	2.1	1.9	2.2	2.1
		9	1.7	2.1	2.6	2.2
	Exp. 2 Mean		2.0	2.0	2.3	2.1
	Overall Mean		1.9	1.9	2.0	2.0
L. reuteri WB-76	1[b]	1	2.0	1.9	1.8	2.0
		9	1.8	2.0	1.9	2.2
		12	2.0	2.0	2.1	2.1
	Exp. 1 Mean		1.9	2.0	1.9	2.1
	2[c]	12	2.2	2.1	2.3	2.3
		13	2.1	1.7	2.1	1.8
		14	1.7	1.6	1.9	1.7
	Exp. 2 Mean		2.0	1.8	2.1	1.9
	Overall Mean		2.0	1.9	2.0	2.0

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C28. Study 2 weekly albumin:globulin ratio levels

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	1.5	1.3	1.5	1.4
		10	1.1	1.2	1.4	1.6
		13	1.5	1.2	1.2	1.2
	Exp. 1 Mean		1.4	1.2	1.4	1.4
	2[c]	1	1.0	1.0	1.1	1.3
		3	1.3	1.2	1.2	1.4
		15	1.1	1.3	1.4	1.6
	Exp. 2 Mean		1.1	1.2	1.2	1.4
	Overall Mean		1.3	1.2	1.3	1.4
L. reuteri DS-36	1[b]	2	1.5	1.8	1.8	1.6
		8	1.3	1.5	1.6	1.8
		14	1.5	1.7	1.6	2.2
	Exp. 1 Mean		1.4	1.7	1.7	1.9
	2[c]	2	1.3	1.3	1.5	1.4
		4	1.6	1.5	1.8	1.7
		10	1.0	1.0	1.4	1.8
	Exp. 2 Mean		1.3	1.3	1.6	1.6
	Overall Mean		1.4	1.5	1.6	1.8
L. reuteri DS-37	1[b]	4	1.6	2.3	2.3	2.3
		6	1.1	1.1	1.3	1.4
		11	1.4	1.3	1.3	1.5
	Exp. 1 Mean		1.4	1.6	1.6	1.7
	2[c]	5	1.2	1.0	1.1	1.3
		6	1.2	1.1	1.1	1.1
		11	1.2	1.1	1.0	1.0
	Exp. 2 Mean		1.2	1.1	1.1	1.1
	Overall Mean		1.3	1.3	1.4	1.4
L. reuteri WB-72	1[b]	3	1.7	1.7	2.1	1.8
		7	1.6	1.5	1.8	1.8
		15	1.3	1.4	1.2	1.2
	Exp. 1 Mean		1.5	1.5	1.7	1.6
	2[c]	7	1.4	1.5	1.5	1.8
		8	1.4	1.3	1.2	1.6
		9	1.7	1.2	1.2	1.4
	Exp. 2 Mean		1.5	1.3	1.3	1.6
	Overall Mean		1.5	1.4	1.5	1.6
L. reuteri WB-76	1[b]	1	1.3	1.2	1.6	1.6
		9	1.6	1.4	1.7	1.5
		12	1.4	1.4	1.4	1.6
	Exp. 1 Mean		1.4	1.3	1.6	1.6
	2[c]	12	1.3	1.3	1.7	1.5
		13	1.5	1.2	1.8	1.5
		14	1.4	1.4	1.6	1.8
	Exp. 2 Mean		1.4	1.3	1.7	1.6
	Overall Mean		1.4	1.3	1.6	1.6

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C29. Study 2 weekly AST[a] levels (U/L)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	96	74	54	45
		10	95	63	53	49
		13	70	151	85	54
	Exp. 1 Mean		87	96	64	49
	2[d]	1	76	48	69	50
		3	54	43	84	49
		15	95	61	74	64
	Exp. 2 Mean		75	51	76	54
	Overall Mean		81	73	70	52
L. reuteri DS-36	1[c]	2	79	79	47	43
		8	60	75	59	47
		14	62	63	74	63
	Exp. 1 Mean		67	72	60	51
	2[d]	2	41	52	51	43
		4	536	42	54	48
		10	49	50	49	48
	Exp. 2 Mean		209	48	51	46
	Overall Mean		138	60	56	49
L. reuteri DS-37	1[c]	4	66	72	69	51
		6	77	101	82	65
		11	72	61	48	47
	Exp. 1 Mean		72	78	66	54
	2[d]	5	60	59	54	50
		6	70	65	114	50
		11	66	51	75	46
	Exp. 2 Mean		65	58	81	49
	Overall Mean		69	68	74	52
L. reuteri WB-72	1[c]	3	188	72	58	50
		7	54	83	97	45
		15	86	80	75	57
	Exp. 1 Mean		109	78	77	51
	2[d]	7	54	45	45	43
		8	68	45	47	45
		9	87	54	60	50
	Exp. 2 Mean		70	48	51	46
	Overall Mean		90	63	64	48
L. reuteri WB-76	1[c]	1	62	102	70	67
		9	58	85	64	45
		12	77	68	56	53
	Exp. 1 Mean		66	85	63	55
	2[d]	12	48	49	59	53
		13	101	48	81	100
		14	65	52	67	55
	Exp. 2 Mean		71	50	69	69
	Overall Mean		69	67	66	62

[a]AST - aspartate aminotransferase

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C30. Study 2 weekly ALT[a] levels (U/L)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	55	41	42	39
		10	80	65	61	61
		13	68	51	61	56
	Exp. 1 Mean		68	52	55	52
	2[d]	1	51	41	53	46
		3	48	45	53	44
		15	67	52	64	69
	Exp. 2 Mean		55	46	57	53
	Overall Mean		62	49	56	53
L. reuteri DS-36	1[c]	2	53	69	61	47
		8	53	65	52	59
		14	43	54	55	56
	Exp. 1 Mean		50	63	56	54
	2[d]	2	39	48	52	43
		4	83	47	50	59
		10	45	33	39	46
	Exp. 2 Mean		56	43	47	49
	Overall Mean		53	53	52	52
L. reuteri DS-37	1[c]	4	65	60	52	56
		6	80	59	73	74
		11	57	64	54	62
	Exp. 1 Mean		67	61	60	64
	2[d]	5	44	50	77	75
		6	56	73	68	60
		11	45	60	57	58
	Exp. 2 Mean		48	61	67	64
	Overall Mean		58	61	64	64
L. reuteri WB-72	1[c]	3	59	56	49	48
		7	54	67	60	66
		15	71	52	61	70
	Exp. 1 Mean		61	58	57	61
	2[d]	7	53	46	50	60
		8	58	51	51	48
		9	61	46	53	49
	Exp. 2 Mean		57	48	51	52
	Overall Mean		59	53	54	57
L. reuteri WB-76	1[c]	1	50	46	56	63
		9	51	49	44	39
		12	76	56	49	62
	Exp. 1 Mean		59	50	50	55
	2[d]	12	35	38	56	47
		13	66	49	72	52
		14	59	54	66	63
	Exp. 2 Mean		53	47	65	54
	Overall Mean		56	49	57	54

[a]ALT - alanine aminotransferase

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C31. Study 2 weekly ALKPhos[a] levels (U/L)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	417	342	218	273
		10	299	237	209	219
		13	343	264	223	239
	Exp. 1 Mean		353	281	217	244
	2[d]	1	237	242	222	217
		3	462	230	216	178
		15	295	155	185	159
	Exp. 2 Mean		331	209	208	185
	Overall Mean		342	245	212	214
L. reuteri DS-36	1[c]	2	379	417	303	267
		8	218	205	140	177
		14	325	257	259	193
	Exp. 1 Mean		307	293	234	212
	2[d]	2	344	243	254	236
		4	461	328	244	197
		10	473	274	336	343
	Exp. 2 Mean		426	282	278	259
	Overall Mean		367	287	256	236
L. reuteri DS-37	1[c]	4	304	294	211	202
		6	352	422	222	243
		11	261	273	158	187
	Exp. 1 Mean		306	330	197	211
	2[d]	5	263	190	249	191
		6	293	228	190	171
		11	409	304	241	179
	Exp. 2 Mean		322	241	227	180
	Overall Mean		314	285	212	196
L. reuteri WB-72	1[c]	3	340	357	231	283
		7	252	239	178	189
		15	386	274	212	235
	Exp. 1 Mean		326	290	207	236
	2[d]	7	296	202	164	121
		8	263	169	170	146
		9	303	138	124	146
	Exp. 2 Mean		287	170	153	138
	Overall Mean		307	230	180	187
L. reuteri WB-76	1[c]	1	402	298	244	286
		9	244	163	132	142
		12	292	256	200	219
	Exp. 1 Mean		313	239	192	216
	2[d]	12	214	213	253	172
		13	615	203	327	236
		14	324	236	210	186
	Exp. 2 Mean		384	217	263	198
	Overall Mean		349	228	228	207

[a]ALKPhos - alkaline phosphatase

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C32. Study 2 weekly bili, total levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0[b]	Week 1[b]	Week 2[b]	Week 3[b]
Control	1[c]	5	0.2	0.1	0.3	0.1
		10	0.2	0.1	0.2	0.2
		13	0.2	0.2	0.1	0.1
	Exp. 1 Mean		0.2	0.1	0.2	0.1
	2[d]	1	0.1	0.1	0.3	0.1
		3	0.2	0.1	0.2	0.1
		15	0.2	0.1	0.1	0.1
	Exp. 2 Mean		0.2	0.1	0.2	0.1
	Overall Mean		0.2	0.1	0.2	0.1
L. reuteri DS-36	1[c]	2	0.3	0.2	0.1	0.2
		8	0.1	0.1	0.1	0.1
		14	0.2	0.2	0.1	0.6
	Exp. 1 Mean		0.2	0.2	0.1	0.3
	2[d]	2	0.1	0.1	0.1	0.1
		4	1.3	0.1	0.1	0.1
		10	0.2	0.1	0.1	0.2
	Exp. 2 Mean		0.5	0.1	0.1	0.1
	Overall Mean		0.4	0.1	0.1	0.2
L. reuteri DS-37	1[c]	4	0.1	0.2	0.1	0.1
		6	0.1	0.1	0.2	0.1
		11	0.2	0.1	0.1	0.1
	Exp. 1 Mean		0.1	0.1	0.1	0.1
	2[d]	5	0.2	0.1	0.2	0.3
		6	0.2	0.2	0.1	0.1
		11	0.2	0.1	0.1	0.1
	Exp. 2 Mean		0.2	0.1	0.1	0.2
	Overall Mean		0.2	0.1	0.1	0.1
L. reuteri WB-72	1[c]	3	0.4	0.2	0.1	0.1
		7	0.1	0.1	0.1	0.1
		15	0.2	0.2	0.2	0.1
	Exp. 1 Mean		0.2	0.2	0.1	0.1
	2[d]	7	0.4	0.2	0.1	0.1
		8	0.2	0.1	0.1	0.1
		9	0.1	0.1	0.1	0.1
	Exp. 2 Mean		0.2	0.1	0.1	0.1
	Overall Mean		0.2	0.2	0.1	0.1
L. reuteri WB-76	1[c]	1	0.2	0.1	0.1	0.3
		9	0.2	0.1	0.2	0.2
		12	0.1	0.1	0.1	0.1
	Exp. 1 Mean		0.2	0.1	0.1	0.2
	2[d]	12	0.1	0.2	0.2	0.4
		13	0.2	0.1	0.1	0.1
		14	0.2	0.1	0.1	0.1
	Exp. 2 Mean		0.2	0.1	0.1	0.2
	Overall Mean		0.2	0.1	0.1	0.2

[a]Description of treatments, experiments, and pigs - see Table C2

[b]All 0.1 individual pig values were equal to <0.1

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C33. Study 2 weekly cholesterol levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	54	64	74	88
		10	58	62	75	84
		13	63	65	69	85
	Exp. 1 Mean		58	64	73	86
	2[c]	1	53	56	73	77
		3	68	92	87	90
		15	76	74	92	70
	Exp. 2 Mean		66	74	84	79
	Overall Mean		62	69	78	82
L. reuteri DS-36	1[b]	2	50[d]	50[d]	87	84
		8	67	63	81	84
		14	78	65	89	89
	Exp. 1 Mean		65	59	86	86
	2[c]	2	71	89	80	95
		4	50[d]	56	67	57
		10	76	84	71	81
	Exp. 2 Mean		66	76	73	78
	Overall Mean		65	68	79	82
L. reuteri DS-37	1[b]	4	50[d]	50[d]	60	73
		6	50	50[d]	52	50
		11	50[d]	60	55	64
	Exp. 1 Mean		50	53	56	62
	2[c]	5	52	53	89	85
		6	72	94	70	84
		11	55	84	75	72
	Exp. 2 Mean		60	77	78	80
	Overall Mean		55	65	67	71
L. reuteri WB-72	1[b]	3	59	62	76	90
		7	63	59	81	84
		15	87	73	77	87
	Exp. 1 Mean		70	65	78	87
	2[c]	7	59	80	68	68
		8	61	50[d]	76	71
		9	54	50[d]	81	70
	Exp. 2 Mean		58	60	75	70
	Overall Mean		64	62	77	78
L. reuteri WB-76	1[b]	1	78	65	80	90
		9	78	73	73	86
		12	53	63	77	78
	Exp. 1 Mean		70	67	77	85
	2[c]	12	70	93	103	97
		13	50[d]	59	91	68
		14	50[d]	50[d]	50[d]	50[d]
	Exp. 2 Mean		57	67	81	72
	Overall Mean		63	67	79	78

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

[b]Values were equal to <50

Table C34. Study 2 weekly triglyceride levels (mg/dL)

Treatment[a]	Exp.[a]	Pig[a]	Day 0	Week 1	Week 2	Week 3
Control	1[b]	5	27	11	28	31
		10	27	30	31	42
		13	30	32	44	39
	Exp. 1 Mean		28	24	34	37
	2[c]	1	59	43	45	50
		3	34	51	73	41
		15	70	48	50	62
	Exp. 2 Mean		54	47	56	51
	Overall Mean		41	36	45	44
L. reuteri DS-36	1[b]	2	43	44	79	35
		8	61	17	18	18
		14	34	43	38	43
	Exp. 1 Mean		46	35	45	32
	2[c]	2	51	44	40	51
		4	35	35	29	38
		10	41	31	32	27
	Exp. 2 Mean		42	37	34	39
	Overall Mean		44	36	39	35
L. reuteri DS-37	1[b]	4	26	18	41	36
		6	41	18	23	29
		11	32	30	38	37
	Exp. 1 Mean		33	22	34	34
	2[c]	5	41	29	42	48
		6	44	49	35	32
		11	91	39	40	47
	Exp. 2 Mean		59	39	39	42
	Overall Mean		46	31	37	38
L. reuteri WB-72	1[b]	3	27	25	32	29
		7	27	22	26	24
		15	48	35	32	45
	Exp. 1 Mean		34	27	30	33
	2[c]	7	30	42	27	36
		8	39	37	31	37
		9	33	25	33	37
	Exp. 2 Mean		34	35	30	37
	Overall Mean		34	31	30	35
L. reuteri WB-76	1[b]	1	50	31	48	39
		9	25	29	51	46
		12	32	22	22	20
	Exp. 1 Mean		36	27	40	35
	2[c]	12	38	48	70	69
		13	27	24	48	33
		14	28	33	35	40
	Exp. 2 Mean		31	35	51	47
	Overall Mean		33	31	46	41

[a]Description of treatments, experiments, and pigs - see Table C2

[b]Experiment 1 were gilts

[c]Experiment 2 were barrows

Table C35. Study 2 weekly HDL[a] levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	24	27	26	32
		10	22	25	31	28
		13	28	21	23	27
	Exp. 1 Mean		25	24	27	29
	2[d]	1	22	24	26	30
		3	27	38	28	33
		15	31	31	37	31
	Exp. 2 Mean		27	31	30	31
	Overall Mean		26	28	29	30
L. reuteri DS-36	1[c]	2	17	14	27	26
		8	28	27	31	30
		14	35	28	36	31
	Exp. 1 Mean		27	23	31	29
	2[d]	2	29	36	32	35
		4	11	25	26	24
		10	31	31	29	30
	Exp. 2 Mean		24	31	29	30
	Overall Mean		25	27	30	29
L. reuteri DS-37	1[c]	4	21	16	23	26
		6	21	14	16	17
		11	21	27	23	26
	Exp. 1 Mean		21	19	21	23
	2[d]	5	22	23	41	42
		6	31	39	25	31
		11	24	34	26	26
	Exp. 2 Mean		26	32	31	33
	Overall Mean		23	26	26	28
L. reuteri WB-72	1[c]	3	26	24	27	32
		7	25	22	25	24
		15	31	26	26	27
	Exp. 1 Mean		27	24	26	28
	2[d]	7	25	31	29	27
		8	24	16	26	27
		9	22	16	28	27
	Exp. 2 Mean		24	21	28	27
	Overall Mean		26	23	27	27
L. reuteri WB-76	1[c]	1	28	21	26	26
		9	34	26	30	30
		12	21	23	28	25
	Exp. 1 Mean		28	23	28	27
	2[d]	12	28	38	36	37
		13	16	22	31	24
		14	17	23	19	19
	Exp. 2 Mean		20	28	29	27
	Overall Mean		24	26	28	27

[a]HDL - high-density lipoprotein

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C36. Study 2 weekly VLDL[a] levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	5	2	6	6
Control	1[c]	10	5	6	6	8
Control	1[c]	13	6	6	9	8
Control	Exp. 1 Mean		5	5	7	7
Control	2[d]	1	12	9	9	10
Control	2[d]	3	7	10	15	8
Control	2[d]	15	14	10	10	12
Control	Exp. 2 Mean		11	10	11	10
Control	Overall Mean		8	7	9	9
L. reuteri DS-36	1[c]	2	9	9	16	7
L. reuteri DS-36	1[c]	8	12	3	4	4
L. reuteri DS-36	1[c]	14	7	9	8	9
L. reuteri DS-36	Exp. 1 Mean		9	7	9	7
L. reuteri DS-36	2[d]	2	10	9	8	10
L. reuteri DS-36	2[d]	4	7	7	6	8
L. reuteri DS-36	2[d]	10	8	6	6	5
L. reuteri DS-36	Exp. 2 Mean		8	7	7	8
L. reuteri DS-36	Overall Mean		9	7	8	7
L. reuteri DS-37	1[c]	4	5	4	8	7
L. reuteri DS-37	1[c]	6	8	4	5	6
L. reuteri DS-37	1[c]	11	6	6	8	7
L. reuteri DS-37	Exp. 1 Mean		6	5	7	7
L. reuteri DS-37	2[d]	5	8	6	8	10
L. reuteri DS-37	2[d]	6	9	10	7	6
L. reuteri DS-37	2[d]	11	18	8	8	9
L. reuteri DS-37	Exp. 2 Mean		12	8	8	8
L. reuteri DS-37	Overall Mean		9	6	7	8
L. reuteri WB-72	1[c]	3	5	5	6	6
L. reuteri WB-72	1[c]	7	5	4	5	5
L. reuteri WB-72	1[c]	15	8	7	6	9
L. reuteri WB-72	Exp. 1 Mean		6	5	6	7
L. reuteri WB-72	2[d]	7	6	8	5	7
L. reuteri WB-72	2[d]	8	8	7	6	7
L. reuteri WB-72	2[d]	9	7	5	7	7
L. reuteri WB-72	Exp. 2 Mean		7	7	6	7
L. reuteri WB-72	Overall Mean		7	6	6	7
L. reuteri WB-76	1[c]	1	10	6	10	8
L. reuteri WB-76	1[c]	9	5	6	10	9
L. reuteri WB-76	1[c]	12	6	4	4	4
L. reuteri WB-76	Exp. 1 Mean		7	5	8	7
L. reuteri WB-76	2[d]	12	8	10	14	14
L. reuteri WB-76	2[d]	13	5	5	10	7
L. reuteri WB-76	2[d]	14	6	7	7	8
L. reuteri WB-76	Exp. 2 Mean		6	7	10	10
L. reuteri WB-76	Overall Mean		7	6	9	8

[a]VLDL - very low-density lipoprotein

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C37. Study 2 weekly IgA[a] levels (mg/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	0.274	0.331	0.397	0.257
		10	0.330	0.267	0.259	0.265
		13	0.253	0.282	0.331	0.305
	Exp. 1 Mean		0.285	0.293	0.329	0.275
	2[d]	1	0.161	0.361	0.401	0.261
		3	0.231	0.368	0.550	0.269
		15	0.418	0.469	0.372	0.749
	Exp. 2 Mean		0.270	0.399	0.441	0.426
	Overall Mean		0.278	0.346	0.385	0.351
L. reuteri DS-36	1[c]	2	0.240	0.303	0.225	0.306
		8	0.253	0.337	0.392	0.350
		14	0.180	0.255	0.340	0.249
	Exp. 1 Mean		0.224	0.298	0.319	0.302
	2[d]	2	0.263	0.777	0.922	0.389
		4	0.733	0.556	0.718	0.368
		10	0.344	0.332	0.519	0.490
	Exp. 2 Mean		0.447	0.555	0.720	0.416
	Overall Mean		0.335	0.426	0.519	0.359
L. reuteri DS-37	1[c]	4	0.276	0.283	0.353	0.245
		6	0.525	0.270	0.266	0.275
		11	0.202	0.251	0.411	0.349
	Exp. 1 Mean		0.334	0.268	0.344	0.290
	2[d]	5	0.496	0.619	0.811	0.273
		6	0.505	0.554	0.861	0.705
		11	0.516	0.745	0.698	0.400
	Exp. 2 Mean		0.506	0.639	0.790	0.459
	Overall Mean		0.420	0.453	0.567	0.374
L. reuteri WB-72	1[c]	3	0.226	0.303	0.268	0.340
		7	0.259	0.244	0.351	0.253
		15	0.254	0.165	0.398	0.275
	Exp. 1 Mean		0.246	0.237	0.339	0.289
	2[d]	7	0.525	0.520	0.892	0.624
		8	0.175	0.213	0.594	0.267
		9	0.310	0.653	0.959	0.264
	Exp. 2 Mean		0.337	0.462	0.815	0.385
	Overall Mean		0.291	0.350	0.577	0.337
L. reusteri WB-76	1[c]	1	0.333	0.355	0.266	0.424
		9	0.393	0.461	0.343	0.371
		12	0.253	0.294	0.309	0.271
	Exp. 1 Mean		0.326	0.370	0.306	0.355
	2[d]	12	0.314	0.499	0.781	0.359
		13	0.466	0.734	0.965	0.301
		14	0.226	0.543	0.494	0.554
	Exp. 2 Mean		0.336	0.592	0.747	0.405
	Overall Mean		0.331	0.481	0.526	0.380

[a]IgA - immunoglobulin A

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C38. Study 2 weekly IgG[a] levels (mg/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	4.714	5.255	9.217	11.400
		10	3.983	4.395	7.284	5.711
		13	4.656	3.302	6.603	8.725
	Exp. 1 Mean		4.451	4.317	7.701	8.612
	2[d]	1	4.003	3.446	2.879	5.412
		3	3.875	4.724	5.258	7.629
		15	3.109	3.358	3.058	4.619
	Exp. 2 Mean		3.662	3.843	3.732	5.887
	Overall Mean		4.057	4.080	5.717	7.249
L. reuteri DS-36	1[c]	2	2.228	3.510	2.734	7.230
		8	3.711	4.391	8.733	7.151
		14	5.402	3.983	5.607	6.105
	Exp. 1 Mean		3.780	3.961	5.691	6.829
	2[d]	2	4.266	4.764	3.885	8.239
		4	3.094	2.594	1.928	2.855
		10	9.864	3.518	3.632	4.275
	Exp. 2 Mean		5.741	3.625	3.148	5.123
	Overall Mean		4.761	3.793	4.420	5.976
L. reuteri DS-37	1[c]	4	3.187	1.937	4.053	14.350
		6	3.341	4.058	9.454	10.440
		11	2.890	4.546	8.365	6.990
	Exp. 1 Mean		3.139	3.514	7.291	10.593
	2[d]	5	5.700	4.829	4.982	5.754
		6	3.566	4.128	2.826	6.289
		11	6.325	3.040	4.068	4.879
	Exp. 2 Mean		5.197	3.999	3.959	5.641
	Overall Mean		4.168	3.756	5.625	8.117
L. reuteri WB-72	1[c]	3	6.020	4.887	5.529	9.288
		7	2.741	1.710	4.170	5.221
		15	3.994	2.095	5.927	8.523
	Exp. 1 Mean		4.252	2.897	5.209	7.677
	2[d]	7	4.261	3.399	3.566	6.921
		8	4.250	3.255	5.210	5.905
		9	2.796	2.593	3.539	4.614
	Exp. 2 Mean		3.769	3.082	4.105	5.813
	Overall Mean		4.010	2.990	4.657	6.745
L. reusteri WB-76	1[c]	1	3.294	3.461	3.672	4.790
		9	5.447	4.742	8.704	7.474
		12	2.532	4.676	5.868	8.149
	Exp. 1 Mean		3.758	4.293	6.081	6.804
	2[d]	12	3.705	1.868	3.992	6.076
		13	4.974	7.241	3.842	4.930
		14	2.172	2.187	4.311	4.271
	Exp. 2 Mean		3.617	3.765	4.048	5.092
	Overall Mean		3.687	4.029	5.065	5.948

[a]IgG - immunoglobulin G

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C39. Study 2 weekly IgM[a] levels (mg/mL)

Treatment[b]	Exp.[b]	Pig[b]	Day 0	Week 1	Week 2	Week 3
Control	1[c]	5	1.040	1.843	2.009	1.639
		10	1.569	1.936	1.898	2.067
		13	1.539	2.779	2.562	3.407
	Exp. 1 Mean		1.383	2.186	2.156	2.371
	2[d]	1	2.887	0.904	0.795	1.124
		3	2.522	1.343	1.697	1.818
		15	1.137	1.523	1.224	1.222
	Exp. 2 Mean		2.182	1.257	1.239	1.388
	Overall Mean		1.782	1.721	1.697	1.880
L. reuteri DS-36	1[c]	2	1.584	2.342	1.971	1.586
		8	1.021	1.166	1.163	1.147
		14	1.306	1.418	1.395	1.621
	Exp. 1 Mean		1.304	1.642	1.510	1.451
	2[d]	2	2.357	1.654	2.520	1.665
		4	2.014	1.908	1.901	1.531
		10	1.694	0.966	1.127	0.305
	Exp. 2 Mean		2.022	1.509	1.849	1.167
	Overall Mean		1.663	1.576	1.680	1.309
L. reuteri DS-37	1[c]	4	1.727	1.246	1.486	2.479
		6	1.864	2.590	2.028	1.993
		11	0.673	1.756	1.855	1.865
	Exp. 1 Mean		1.421	1.864	1.790	2.112
	2[d]	5	1.192	1.131	2.025	1.250
		6	2.436	3.073	2.797	3.025
		11	2.122	1.835	2.985	1.289
	Exp. 2 Mean		1.917	2.013	2.602	1.855
	Overall Mean		1.669	1.939	2.196	1.984
L. reuteri WB-72	1[c]	3	0.957	1.614	2.686	2.559
		7	1.041	1.246	1.313	1.700
		15	1.735	2.697	2.763	1.883
	Exp. 1 Mean		1.244	1.852	2.254	2.047
	2[d]	7	1.496	1.635	1.581	1.633
		8	1.159	1.111	2.910	0.833
		9	1.166	1.922	2.004	0.871
	Exp. 2 Mean		1.274	1.556	2.165	1.112
	Overall Mean		1.259	1.704	2.210	1.580
L. reusteri WB-76	1[c]	1	2.431	2.228	3.297	2.138
		9	0.941	1.709	1.396	1.215
		12	1.118	2.624	2.220	2.636
	Exp. 1 Mean		1.497	2.187	2.304	1.996
	2[d]	12	1.765	0.836	1.510	1.247
		13	1.841	2.265	2.743	2.332
		14	1.005	1.314	1.552	1.209
	Exp. 2 Mean		1.537	1.472	1.935	1.596
	Overall Mean		1.517	1.829	2.120	1.796

[a]IgM - immunoglobulin M

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C40. Study 2 overall LPS[a] challenge feed intake (kg)

Treatment[b]	Exp.[b]	Pig[b]	FI[c]
Control	1[d]	5	0.56
		10	0.82
		13	0.64
	Exp. 1 Mean		0.68
	2[e]	1	0.74
		3	0.55
		15	0.49
	Exp. 2 Mean		0.60
	Overall Mean		0.64
L. reuteri DS-36	1[d]	2	0.67
		8	0.86
		14	0.80
	Exp. 1 Mean		0.77
	2[e]	2	0.89
		4	0.45
		10	0.38
	Exp. 2 Mean		0.57
	Overall Mean		0.67
L. reuteri DS-37	1[d]	4	0.73
		6	0.86
		11	0.36
	Exp. 1 Mean		0.65
	2[e]	5	0.47
		6	0.47
		11	0.85
	Exp. 2 Mean		0.60
	Overall Mean		0.62
L. reuteri WB-72	1[d]	3	0.78
		7	0.46
		15	0.73
	Exp. 1 Mean		0.66
	2[e]	7	0.56
		8	0.27
		9	0.87
	Exp. 2 Mean		0.57
	Overall Mean		0.61
L. reuteri WB-76	1[d]	1	0.81
		9	0.57
		12	0.89
	Exp. 1 Mean		0.76
	2[e]	12	0.77
		13	0.24
		14	0.03
	Exp. 2 Mean		0.35
	Overall Mean		0.55

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]FI - feed intake

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C41. Study 2 LPS[a] challenge swine weights (kg)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	17.33	16.51	16.24	16.60
		10	18.51	17.92	17.78	19.23
		13	19.96	19.41	19.37	20.50
	Exp. 1 Mean		18.60	17.95	17.80	18.78
	2[d]	1	16.24	15.97	15.51	17.28
		3	19.78	19.69	19.14	19.41
		15	15.33	14.97	14.79	16.33
	Exp. 2 Mean		17.12	16.87	16.48	17.67
	Overall Mean		17.86	17.41	17.14	18.23
L. reuteri DS-36	1[c]	2	15.88	15.33	15.06	15.79
		8	19.32	18.82	18.37	19.91
		14	22.41	21.91	22.00	22.72
	Exp. 1 Mean		19.20	18.69	18.48	19.47
	2[d]	2	20.50	20.14	19.87	21.27
		4	20.23	20.50	19.32	20.05
		10	13.79	13.52	13.24	13.83
	Exp. 2 Mean		18.17	18.05	17.48	18.39
	Overall Mean		18.69	18.37	17.98	18.93
L. reuteri DS-37	1[c]	4	18.42	17.92	17.42	18.64
		6	19.78	19.23	19.14	20.50
		11	19.05	18.33	18.28	18.87
	Exp. 1 Mean		19.08	18.49	18.28	19.34
	2[d]	5	16.87	16.87	16.87	16.78
		6	14.61	14.70	14.42	14.97
		11	16.24	15.97	15.42	17.06
	Exp. 2 Mean		15.91	15.85	15.57	16.27
	Overall Mean		17.49	17.17	16.93	17.80
L. reuteri WB-72	1[c]	3	18.60	18.14	17.96	18.78
		7	19.50	19.01	19.28	19.41
		15	16.51	16.06	15.83	17.19
	Exp. 1 Mean		18.20	17.74	17.69	18.46
	2[d]	7	19.96	19.87	19.23	19.69
		8	14.61	14.51	13.70	13.88
		9	16.51	16.24	15.79	17.42
	Exp. 2 Mean		17.02	16.87	16.24	16.99
	Overall Mean		17.61	17.30	16.96	17.73
L. reuteri WB-76	1[c]	1	17.69	17.42	16.96	17.74
		9	17.51	17.15	16.87	17.92
		12	20.96	20.32	19.82	21.00
	Exp. 1 Mean		18.72	18.29	17.89	18.88
	2[d]	12	17.96	17.69	17.64	19.50
		13	18.51	18.05	17.78	18.51
		14	17.33	16.78	16.51	16.60
	Exp. 2 Mean		17.93	17.51	17.31	18.20
	Overall Mean		18.33	17.90	17.60	18.54

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C42. Study 2 hourly LPS[a] challenge rectal temperatures (℃)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	39.24	40.29	40.96	40.52	40.18	39.63
		10	38.79	39.79	40.52	39.68	39.07	39.46
		12	39.24	39.46	39.90	39.02	39.63	39.24
	Exp. 1 Mean		39.09	39.85	40.46	39.74	39.63	39.44
	2[d]	1	39.29	40.13	40.90	39.90	39.24	40.13
		3	39.41	39.79	40.46	40.85	41.01	40.68
		15	39.18	38.85	40.57	39.96	39.79	39.57
	Exp. 2 Mean		39.29	39.59	40.64	40.24	40.02	40.13
	Overall Mean		39.19	39.72	40.55	39.99	39.82	39.78
L. reuteri DS-36	1[c]	2	38.96	39.57	40.24	39.74	39.90	39.85
		8	39.13	39.90	40.02	39.79	39.57	39.41
		14	39.41	40.68	40.96	40.52	39.57	39.29
	Exp. 1 Mean		39.16	40.05	40.40	40.02	39.68	39.52
	2[d]	2	39.13	39.57	39.90	39.35	39.90	40.07
		4	39.68	40.07	40.79	40.40	40.79	40.40
		10	39.57	40.29	40.90	40.63	40.52	40.02
	Exp. 2 Mean		39.46	39.98	40.53	40.13	40.40	40.16
	Overall Mean		39.31	40.02	40.47	40.07	40.04	39.84
L. reuteri DS-37	1[c]	4	38.74	39.52	40.18	39.79	39.74	39.35
		6	39.07	39.29	40.52	39.35	39.29	39.41
		11	39.35	40.24	40.46	40.13	40.52	39.46
	Exp. 1 Mean		39.05	39.68	40.39	39.76	39.85	39.41
	2[d]	5	39.29	39.79	40.13	40.18	40.02	39.96
		6	39.07	39.18	39.85	39.74	39.63	39.96
		11	39.41	39.29	40.29	40.46	39.35	39.35
	Exp. 2 Mean		39.26	39.42	40.09	40.13	39.66	39.76
	Overall Mean		39.16	39.55	40.24	39.94	39.76	39.58
L. reuteri WB-72	1[c]	3	39.18	39.74	40.85	40.57	39.96	39.68
		7	39.13	39.90	40.52	39.85	40.40	39.29
		15	38.96	38.24	40.29	39.68	39.85	39.68
	Exp. 1 Mean		39.09	39.29	40.55	40.03	40.07	39.55
	2[d]	7	38.96	39.52	40.63	40.90	40.74	40.40
		8	38.79	40.02	40.52	40.13	39.74	39.57
		9	39.07	39.29	39.57	38.85	39.35	39.57
	Exp. 2 Mean		38.94	39.61	40.24	39.96	39.94	39.85
	Overall Mean		39.02	39.45	40.39	40.00	40.01	39.70
L. reuteri WB-76	1[c]	1	39.18	39.68	40.35	39.35	39.57	39.85
		9	39.07	39.63	40.79	39.74	39.68	39.35
		12	39.07	39.29	39.79	40.29	39.63	39.46
	Exp. 1 Mean		39.11	39.53	40.31	39.79	39.63	39.55
	2[d]	12	38.79	39.96	40.52	39.68	39.52	39.79
		13	39.24	39.96	40.79	40.52	40.07	39.79
		14	39.24	39.35	40.40	40.74	40.07	39.85
	Exp. 2 Mean		39.09	39.76	40.57	40.31	39.89	39.81
	Overall Mean		39.10	39.65	40.44	40.05	39.76	39.68

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C43. Study 2 hourly LPS[a] challenge glucose levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	136	143	143	96	79	122
		10	137	140	141	120	74	118
		13	108	110	133	103	52	114
	Exp. 1 Mean		127	131	139	106	68	118
	2[d]	1	102	114	99	91	68	116
		3	86	104	92	69	68	104
		15	106	117	101	111	98	103
	Exp. 2 Mean		98	112	97	90	78	108
	Overall Mean		113	121	118	98	73	113
L. reuteri DS-36	1[c]	2	108	114	116	98	63	103
		8	116	126	161	121	93	124
		14	108	106	132	84	57	114
	Exp. 1 Mean		111	115	136	101	71	114
	2[d]	2	98	99	96	103	84	113
		4	111	110	113	110	95	108
		10	101	110	98	72	71	124
	Exp. 2 Mean		103	106	102	95	83	115
	Overall Mean		107	111	119	98	77	114
L. reuteri DS-37	1[c]	4	132	120	142	122	68	120
		6	127	122	131	94	61	114
		11	126	127	136	115	99	99
	Exp. 1 Mean		128	123	136	110	76	111
	2[d]	5	99	100	104	102	73	110
		6	102	98	94	102	76	137
		11	109	104	98	112	87	119
	Exp. 2 Mean		103	101	99	105	79	122
	Overall Mean		116	112	118	108	77	117
L. reuteri WB-72	1[c]	3	118	141	155	89	76	113
		7	116	108	135	114	73	120
		15	103	96	105	79	57	91
	Exp. 1 Mean		112	115	132	94	69	108
	2[d]	7	117	107	114	133	102	115
		8	97	113	94	77	51	153
		9	94	101	94	89	62	112
	Exp. 2 Mean		103	107	101	100	72	127
	Overall Mean		108	111	116	97	70	117
L. reuteri WB-76	1[c]	1	129	122	140	98	72	142
		9	117	123	130	113	81	104
		12	116	125	157	141	103	123
	Exp. 1 Mean		121	123	142	117	85	123
	2[d]	12	102	102	98	65	63	113
		13	106	119	100	77	69	103
		14	101	99	94	77	76	78
	Exp. 2 Mean		103	107	97	73	69	98
	Overall Mean		112	115	120	95	77	111

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C44. Study 2 hourly LPS[a] challenge BUN[b] levels (mg/dL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	9	9	9	10	13	12
		10	10	11	11	10	11	15
		13	7	6	7	7	11	12
	Exp. 1 Mean		9	9	9	9	12	13
	2[e]	1	6	7	7	9	12	8
		3	6	7	7	11	15	15
		15	10	10	10	8	8	8
	Exp. 2 Mean		7	8	8	9	12	10
	Overall Mean		8	8	9	9	12	12
L. reuteri DS-36	1[d]	2	8	8	9	9	12	10
		8	9	9	10	9	8	11
		14	10	10	10	10	14	10
	Exp. 1 Mean		9	9	10	9	11	10
	2[e]	2	9	9	10	10	10	11
		4	10	10	10	9	7	11
		10	6	7	7	10	16	11
	Exp. 2 Mean		8	9	9	10	11	11
	Overall Mean		9	9	9	10	11	11
L. reuteri DS-37	1[d]	4	9	9	10	9	9	11
		6	11	11	12	10	10	11
		11	13	14	14	13	12	10
	Exp. 1 Mean		11	11	12	11	10	11
	2[e]	5	6	6	7	7	10	13
		6	7	8	8	10	13	11
		11	16	15	16	15	10	9
	Exp. 2 Mean		10	10	10	11	11	11
	Overall Mean		10	11	11	11	11	11
L. reuteri WB-72	1[d]	3	9	8	9	8	13	11
		7	10	10	10	10	9	10
		15	11	11	11	10	12	14
	Exp. 1 Mean		10	10	10	9	11	12
	2[e]	7	10	9	9	10	9	11
		8	7	7	7	8	12	15
		9	7	8	8	8	9	10
	Exp. 2 Mean		8	8	8	9	10	12
	Overall Mean		9	9	9	9	11	12
L. reuteri WB-76	1[d]	1	11	11	11	12	17	15
		9	12	12	12	11	11	14
		12	12	12	12	11	8	12
	Exp. 1 Mean		12	12	12	11	12	14
	2[e]	12	6	6	6	7	13	15
		13	8	8	8	8	10	10
		14	12	12	12	12	12	8
	Exp. 2 Mean		9	9	9	9	12	11
	Overall Mean		10	10	10	10	12	12

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]BUN - blood urea nitrogen

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C45. Study 2 hourly LPS[a] challenge creatinine levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	1.0	1.0	1.2	1.0	1.4	1.1
		10	1.0	1.1	1.3	1.2	1.1	1.1
		13	1.0	1.0	1.2	1.1	1.1	1.1
	Exp. 1 Mean		1	1.0	1.2	1.1	1.2	1.1
	2[d]	1	1.1	1.1	1.2	1.2	1.5	1.3
		3	1.3	1.4	1.4	1.7	1.6	1.6
		15	1.3	1.3	1.3	1.4	1.2	1.0
	Exp. 2 Mean		1.2	1.3	1.3	1.4	1.4	1.3
	Overall Mean		1.1	1.2	1.3	1.3	1.3	1.2
L. reuteri DS-36	1[c]	2	0.9	0.9	1.0	0.9	1.0	0.9
		8	1.1	1.0	1.3	1.0	1.0	1.0
		14	1.0	1.1	1.1	1.1	1.3	1.0
	Exp. 1 Mean		1.0	1.0	1.1	1.0	1.1	1.0
	2[d]	2	1.3	1.3	1.3	1.3	1.5	1.3
		4	1.2	1.2	1.2	1.3	1.2	1.4
		10	0.9	0.8	1.0	1.1	1.3	1.0
	Exp. 2 Mean		1.1	1.1	1.2	1.2	1.3	1.2
	Overall Mean		1.1	1.1	1.2	1.1	1.2	1.1
L. reuteri DS-37	1[c]	4	1.1	1.1	1.2	1.2	1.2	1.1
		6	0.9	0.9	1.0	0.9	1.0	1.0
		11	1.4	1.2	1.5	1.3	1.3	1.1
	Exp. 1 Mean		1.1	1.1	1.2	1.1	1.2	1.1
	2[d]	5	1.3	1.2	1.3	1.4	1.2	1.3
		6	1.4	1.4	1.5	1.6	1.4	1.3
		11	1.2	1.2	1.3	1.5	1.2	1.1
	Exp. 2 Mean		1.3	1.3	1.4	1.5	1.3	1.2
	Overall Mean		1.2	1.2	1.3	1.3	1.2	1.2
L. reuteri WB-72	1[c]	3	1.1	1.2	1.4	1.2	1.5	1.3
		7	1.0	1.1	1.2	1.1	1.1	1.1
		15	0.9	0.9	1.0	0.9	1.1	1.0
	Exp. 1 Mean		1.0	1.1	1.2	1.1	1.2	1.1
	2[d]	7	1.3	1.3	1.4	1.6	1.3	1.4
		8	0.9	0.9	1.0	1.1	1.3	1.3
		9	0.9	0.9	1.0	1.0	1.1	1.0
	Exp. 2 Mean		1.0	1.0	1.1	1.2	1.2	1.2
	Overall Mean		1.0	1.1	1.2	1.2	1.2	1.2
L. reuteri WB-76	1[c]	1	1.1	1.0	1.2	1.0	1.3	1.1
		9	1.2	1.1	1.2	1.1	1.1	1.1
		12	1.0	1.0	1.1	1.1	1.1	1.1
	Exp. 1 Mean		1.1	1.0	1.2	1.1	1.2	1.1
	2[d]	12	1.1	1.1	1.2	1.2	1.5	1.3
		13	1.1	1.2	1.2	1.3	1.4	1.3
		14	1.1	1.1	1.2	1.2	1.2	1.1
	Exp. 2 Mean		1.1	1.1	1.2	1.2	1.4	1.2
	Overall Mean		1.1	1.1	1.2	1.2	1.3	1.2

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C46. Study 2 hourly LPS[a] challenge BUN[b]:creatinine ratio levels

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	9.2	9.4	8.0	9.4	9.9	10.7
		10	10.0	9.7	8.6	8.8	9.3	13.5
		13	6.6	6.3	5.7	6.8	9.4	11.2
	Exp. 1 Mean		8.6	8.5	7.4	8.3	9.5	11.8
	2[e]	1	5.8	6.0	6.2	7.1	8.2	6.3
		3	4.9	4.9	5.1	6.7	9.6	9.6
		15	7.8	7.8	7.5	5.9	6.4	7.8
	Exp. 2 Mean		6.2	6.2	6.3	6.6	8.1	7.9
	Overall Mean		7.4	7.4	6.9	7.5	8.8	9.9
L. reuteri DS-36	1[d]	2	8.4	9.1	8.7	9.6	12.1	10.7
		8	8.3	9.7	7.6	9.2	8.3	11.0
		14	9.7	8.8	8.8	9.6	10.4	9.5
	Exp. 1 Mean		8.8	9.2	8.4	9.5	10.3	10.4
	2[e]	2	7.2	7.0	7.3	7.7	6.3	8.6
		4	8.1	8.2	7.7	6.6	6.2	7.8
		10	7.0	8.2	6.8	9.1	12.7	10.7
	Exp. 2 Mean		7.4	7.8	7.3	7.8	8.4	9.0
	Overall Mean		8.1	8.5	7.8	8.6	9.3	9.7
L. reuteri DS-37	1[d]	4	8.0	8.6	8.0	7.3	7.2	9.7
		6	12.3	13.1	11.6	10.9	10.2	11.6
		11	9.7	11.4	9.3	10.1	9.1	9.8
	Exp. 1 Mean		10.0	11.0	9.6	9.4	8.8	10.4
	2[e]	5	4.8	5.2	5.1	5.2	8.5	9.7
		6	5.3	5.7	5.7	6.0	8.7	8.1
		11	13.2	12.3	12.1	10.2	8.4	8.1
	Exp. 2 Mean		7.8	7.7	7.6	7.1	8.5	8.6
	Overall Mean		8.9	9.4	8.6	8.3	8.7	9.5
L. reuteri WB-72	1[d]	3	7.9	6.8	6.3	6.7	8.3	8.9
		7	9.2	9.2	8.3	8.6	8.6	9.2
		15	12.2	11.6	11.0	10.4	10.3	13.1
	Exp. 1 Mean		9.8	9.2	8.5	8.6	9.1	10.4
	2[e]	7	7.2	7.3	6.6	6.2	7.2	8.0
		8	7.3	7.6	7.4	7.4	9.3	11.1
		9	7.7	8.5	8.1	8.2	8.4	10.3
	Exp. 2 Mean		7.4	7.8	7.4	7.3	8.3	9.8
	Overall Mean		8.6	8.5	8.0	7.9	8.7	10.1
L. reuteri WB-76	1[d]	1	10.5	11.3	9.9	11.4	12.8	14.1
		9	10.2	10.7	9.9	9.6	9.9	13.1
		12	11.5	12.2	11.0	9.7	7.5	11.2
	Exp. 1 Mean		10.7	11.4	10.3	10.2	10.1	12.8
	2[e]	12	5.5	5.1	4.5	5.8	8.9	11.7
		13	7.2	6.9	6.7	6.5	6.9	7.8
		14	10.6	10.8	9.9	9.6	10.4	7.5
	Exp. 2 Mean		7.8	7.6	7.0	7.3	8.7	9.0
	Overall Mean		9.3	9.5	8.7	8.8	9.4	10.9

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]BUN - blood urea nitrogen

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C47. Study 2 hourly LPS[a] challenge sodium levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	141	138	149	141	141	141
		10	139	141	151	143	138	141
		13	141	140	151	144	139	140
	Exp. 1 Mean		140	140	150	143	139	141
	2[d]	1	134	137	138	142	136	139
		3	140	141	142	164	138	144
		15	135	138	137	136	141	138
	Exp. 2 Mean		136	139	139	147	138	140
	Overall Mean		138	139	145	145	139	141
L. reuteri DS-36	1[c]	2	143	140	148	136	140	142
		8	140	138	156	141	139	139
		14	137	139	145	137	138	138
	Exp. 1 Mean		140	139	150	138	139	140
	2[d]	2	137	139	139	145	139	140
		4	139	140	146	148	139	144
		10	135	135	138	137	133	136
	Exp. 2 Mean		137	138	141	143	137	140
	Overall Mean		139	139	145	141	138	140
L. reuteri DS-37	1[c]	4	142	141	152	143	141	140
		6	140	140	152	134	139	140
		11	141	140	152	142	142	144
	Exp. 1 Mean		141	140	152	140	141	141
	2[d]	5	138	137	143	146	139	139
		6	133	136	139	144	132	138
		11	133	134	134	140	134	137
	Exp. 2 Mean		135	136	139	143	135	138
	Overall Mean		138	138	145	142	138	140
L. reuteri WB-72	1[c]	3	143	145	151	137	140	143
		7	139	140	152	142	138	141
		15	138	139	144	134	138	140
	Exp. 1 Mean		140	141	149	138	139	141
	2[d]	7	138	138	139	152	136	141
		8	139	137	138	137	137	137
		9	138	140	139	135	139	137
	Exp. 2 Mean		138	138	139	141	137	138
	Overall Mean		139	140	144	140	138	140
L. reuteri WB-76	1[c]	1	146	141	148	139	141	144
		9	142	138	148	139	138	141
		12	141	139	148	147	142	141
	Exp. 1 Mean		143	139	148	142	140	142
	2[d]	12	135	137	139	140	138	140
		13	136	139	140	140	136	139
		14	137	137	139	135	139	139
	Exp. 2 Mean		136	138	139	138	138	139
	Overall Mean		140	139	144	140	139	141

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C48. Study 2 hourly LPS[a] challenge potassium levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	10.6	9.7	9.4	8.9	7.6	8.2
		10	10.7	9.1	9.6	9.0	7.4	8.9
		13	9.0	8.6	9.2	8.0	8.0	8.9
	Exp. 1 Mean		10.1	9.1	9.4	8.6	7.7	8.7
	2[d]	1	8.9	8.1	9.1	8.7	7.3	8.5
		3	9.9	9.5	9.3	11.0	8.0	8.7
		15	10.8	10.2	10.6	9.8	8.8	9.9
	Exp. 2 Mean		9.9	9.3	9.7	9.8	8.0	9.0
	Overall Mean		10.0	9.2	9.5	9.2	7.9	8.9
L. reuteri DS-36	1[c]	2	8.9	8.3	9.0	8.5	8.0	8.8
		8	8.8	9.0	8.8	7.5	7.2	9.5
		14	9.5	8.6	8.8	8.0	7.5	8.5
	Exp. 1 Mean		9.1	8.6	8.9	8.0	7.6	8.9
	2[d]	2	9.2	8.6	9.9	10.3	8.6	8.2
		4	9.3	9.0	10.5	9.3	8.1	8.6
		10	9.2	8.8	8.7	8.1	6.8	7.6
	Exp. 2 Mean		9.2	8.8	9.7	9.2	7.8	8.1
	Overall Mean		9.2	8.7	9.3	8.6	7.7	8.5
L. reuteri DS-37	1[c]	4	9.7	8.8	9.8	9.1	7.9	8.6
		6	9.7	8.8	9.2	8.3	7.2	8.3
		11	8.6	9.4	8.7	7.8	8.0	8.0
	Exp. 1 Mean		9.3	9.0	9.2	8.4	7.7	8.3
	2[d]	5	11.5	9.4	10.1	9.5	8.3	8.3
		6	9.3	9.3	10.1	9.7	7.6	9.7
		11	10.6	9.6	9.6	9.1	7.1	8.9
	Exp. 2 Mean		10.5	9.4	9.9	9.4	7.7	9.0
	Overall Mean		9.9	9.2	9.6	8.9	7.7	8.6
L. reuteri WB-72	1[c]	3	10.0	10.0	9.2	8.9	7.7	8.9
		7	9.0	8.7	8.2	7.6	7.0	7.8
		15	9.5	9.0	9.5	8.8	7.3	8.6
	Exp. 1 Mean		9.5	9.2	9.0	8.4	7.3	8.4
	2[d]	7	10.2	8.7	10.9	10.1	8.1	9.0
		8	10.3	9.6	8.8	9.3	7.6	9.2
		9	10.2	9.1	9.3	9.0	8.0	9.7
	Exp. 2 Mean		10.2	9.1	9.7	9.5	7.9	9.3
	Overall Mean		9.9	9.2	9.3	9.0	7.6	8.9
L. reuteri WB-76	1[c]	1	10.4	10.4	9.8	8.9	7.5	8.6
		9	11.3	9.6	11.2	9.5	8.1	8.8
		12	8.0	7.8	10.4	8.5	7.3	8.0
	Exp. 1 Mean		9.9	9.3	10.5	9.0	7.6	8.5
	2[d]	12	11.5	9.1	9.9	9.9	7.6	9.0
		13	10.5	9.6	9.5	8.1	7.5	8.2
		14	8.8	7.8	9.4	8.0	7.4	7.4
	Exp. 2 Mean		10.3	8.8	9.6	8.7	7.5	8.2
	Overall Mean		10.1	9.1	10.0	8.8	7.6	8.3

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C49. Study 2 hourly LPS[a] challenge chloride levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	105	104	105	105	103	103
		10	107	107	106	104	105	105
		13	102	102	103	101	100	103
	Exp. 1 Mean		105	104	105	103	103	104
	2[d]	1	99	102	102	104	102	103
		3	104	105	103	120	99	106
		15	102	102	105	101	100	105
	Exp. 2 Mean		102	103	103	108	100	105
	Overall Mean		103	104	104	106	102	104
L. reuteri DS-36	1[c]	2	102	103	104	102	102	105
		8	101	102	106	98	102	103
		14	102	103	104	103	100	104
	Exp. 1 Mean		102	103	105	101	101	104
	2[d]	2	101	102	102	107	100	103
		4	105	106	113	110	104	105
		10	100	103	100	100	99	100
	Exp. 2 Mean		102	104	105	106	101	103
	Overall Mean		102	103	105	103	101	103
L. reuteri DS-37	1[c]	4	105	104	106	104	104	102
		6	105	107	109	105	105	102
		11	104	109	109	105	105	109
	Exp. 1 Mean		105	107	108	105	105	104
	2[d]	5	104	104	106	111	99	106
		6	97	99	100	105	94	103
		11	103	101	103	107	103	102
	Exp. 2 Mean		101	101	103	108	99	104
	Overall Mean		103	104	106	106	102	104
L. reuteri WB-72	1[c]	3	103	106	104	101	100	104
		7	106	106	108	104	104	107
		15	103	104	100	101	102	104
	Exp. 1 Mean		104	105	104	102	102	105
	2[d]	7	103	103	107	114	103	103
		8	102	101	103	99	99	101
		9	101	101	100	97	101	101
	Exp. 2 Mean		102	102	103	103	101	102
	Overall Mean		103	104	104	103	102	103
L. reuteri WB-76	1[c]	1	107	107	105	101	101	106
		9	106	105	105	102	104	107
		12	103	106	104	102	100	103
	Exp. 1 Mean		105	106	105	102	102	105
	2[d]	12	103	101	101	104	97	102
		13	103	103	103	105	101	106
		14	101	103	104	101	102	107
	Exp. 2 Mean		102	102	103	103	100	105
	Overall Mean		104	104	104	103	101	105

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C50. Study 2 hourly LPS[a] challenge carbon dioxide levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	25	24	27	21	24	29
		10	20	23	28	24	22	26
		13	26	28	31	31	24	26
	Exp. 1 Mean		24	25	29	25	23	27
	2[d]	1	28	27	25	28	24	22
		3	23	21	27	29	26	24
		15	25	25	24	26	26	24
	Exp. 2 Mean		25	24	25	28	25	23
	Overall Mean		25	25	27	27	24	25
L. reuteri DS-36	1[c]	2	25	27	27	20	27	27
		8	30	25	30	26	26	26
		14	24	28	27	24	23	25
	Exp. 1 Mean		26	27	28	23	25	26
	2[d]	2	26	27	28	30	28	26
		4	23	22	21	25	25	26
		10	27	23	26	27	24	27
	Exp. 2 Mean		25	24	25	27	26	26
	Overall Mean		26	25	27	25	26	26
L. reuteri DS-37	1[c]	4	26	23	29	25	25	28
		6	25	24	26	22	25	31
		11	24	23	27	27	24	26
	Exp. 1 Mean		25	23	27	25	25	28
	2[d]	5	21	26	26	25	28	24
		6	26	26	28	28	28	18
		11	23	23	24	26	24	18
	Exp. 2 Mean		23	25	26	26	27	20
	Overall Mean		24	24	27	26	26	24
L. reuteri WB-72	1[c]	3	27	23	28	24	24	25
		7	24	25	27	26	24	24
		15	24	26	28	20	22	26
	Exp. 1 Mean		25	25	28	23	23	25
	2[d]	7	24	26	22	29	23	25
		8	25	24	23	28	26	20
		9	27	28	26	26	26	24
	Exp. 2 Mean		25	26	24	28	25	23
	Overall Mean		25	25	26	26	24	24
L. reuteri WB-76	1[c]	1	29	23	28	26	27	27
		9	25	24	29	24	24	26
		12	26	23	23	30	27	29
	Exp. 1 Mean		27	23	27	27	26	27
	2[d]	12	23	26	25	26	27	22
		13	26	24	28	25	25	25
		14	28	24	23	25	25	23
	Exp. 2 Mean		26	25	25	25	26	23
	Overall Mean		26	24	26	26	26	25

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C51. Study 2 hourly LPS[a] challenge anion gap levels

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	21.6	20.1	26.4	24.4	22.0	16.7
		10	21.7	19.7	25.3	24.4	18.2	19.7
		13	21.8	18.4	26.9	20.1	23.0	19.0
	Exp. 1 Mean		21.7	19.4	26.2	23.0	21.1	18.5
	2[d]	1	15.8	17.0	19.3	18.9	17.4	22.5
		3	22.9	23.9	20.7	25.3	21.2	22.5
		15	20.0	21.5	18.3	19.1	23.0	19.5
	Exp. 2 Mean		19.6	20.8	19.4	21.1	20.5	21.5
	Overall Mean		20.6	20.1	22.8	22.0	20.8	20.0
L. reuteri DS-36	1[c]	2	24.2	18.6	25.9	22.6	19.1	18.8
		8	18.0	20.0	28.5	24.2	18.5	19.0
		14	20.6	16.6	22.6	18.4	21.7	17.4
	Exp. 1 Mean		20.9	18.4	25.7	21.7	19.8	18.4
	2[d]	2	19.6	18.6	18.3	18.5	19.2	19.2
		4	19.9	21.0	22.1	22.0	18.7	21.5
		10	17.1	18.5	19.9	18.7	17.5	16.1
	Exp. 2 Mean		18.9	19.4	20.1	19.7	18.5	18.9
	Overall Mean		19.9	18.9	22.9	20.7	19.1	18.7
L. reuteri DS-37	1[c]	4	21.2	22.4	27.3	23.7	19.6	18.7
		6	19.1	17.4	25.8	15.6	16.6	15.8
		11	21.0	17.5	25.1	17.6	21.5	17.2
	Exp. 1 Mean		20.4	19.1	26.1	19.0	19.2	17.2
	2[d]	5	25.1	17.3	21.1	20.0	19.4	17.4
		6	19.2	20.4	21.3	20.5	17.8	27.4
		11	17.6	19.5	17.6	17.0	13.8	25.5
	Exp. 2 Mean		20.6	19.1	20.0	19.2	17.0	23.4
	Overall Mean		20.5	19.1	23.0	19.1	18.1	20.3
L. reuteri WB-72	1[c]	3	23.1	26.4	28.3	20.4	24.1	23.8
		7	17.3	18.2	25.8	20.1	17.1	17.2
		15	19.9	18.0	25.3	22.4	21.9	18.4
	Exp. 1 Mean		20.1	20.9	26.5	21.0	21.0	19.8
	2[d]	7	20.5	18.0	20.1	19.4	19.2	20.7
		8	21.7	21.0	19.8	19.6	20.0	24.6
		9	21.3	20.4	23.2	20.8	19.5	21.5
	Exp. 2 Mean		21.2	19.8	21.0	19.9	19.6	22.3
	Overall Mean		20.6	20.3	23.8	20.5	20.3	21.0
L. reuteri WB-76	1[c]	1	20.8	21.1	25.6	20.8	20.8	20.4
		9	22.5	19.0	26.2	23.1	17.7	17.2
		12	20.3	18.4	31.4	23.7	22.3	16.4
	Exp. 1 Mean		21.2	19.5	27.7	22.5	20.3	18.0
	2[d]	12	20.9	19.5	23.0	19.4	21.9	24.3
		13	17.7	21.6	18.2	18.3	17.4	16.2
		14	16.8	17.8	21.1	17.0	19.2	17.0
	Exp. 2 Mean		18.5	19.6	20.8	18.2	19.5	19.2
	Overall Mean		19.8	19.6	24.3	20.4	19.9	18.6

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C52. Study 2 hourly LPS[a] challenge calcium levels (mEq/L)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	10.3	9.6	12.6	9.0	7.9	9.1
		10	10.4	10.1	15.1	12.7	8.2	10.3
		13	9.9	9.7	13.9	10.0	7.5	10.0
	Exp. 1 Mean		10.2	9.8	13.9	10.6	7.9	9.8
	2[d]	1	10.4	10.5	10.3	8.4	8.9	11.2
		3	10.6	10.7	10.5	11.4	9.0	9.7
		15	10.8	10.5	10.3	9.6	9.8	10.1
	Exp. 2 Mean		10.6	10.6	10.4	9.8	9.2	10.3
	Overall Mean		10.4	10.2	12.1	10.2	8.6	10.1
L. reuteri DS-36	1[c]	2	10.2	9.8	13.6	8.3	8.2	9.6
		8	10.6	10.3	14.6	12.0	8.8	10.8
		14	9.8	10.1	12.1	8.5	7.8	10.0
	Exp. 1 Mean		10.2	10.1	13.4	9.6	8.3	10.1
	2[d]	2	10.8	10.6	10.7	10.7	9.9	10.8
		4	10.8	9.8	10.6	9.7	8.9	10.0
		10	10.3	9.8	10.1	7.9	8.3	9.3
	Exp. 2 Mean		10.6	10.1	10.5	9.4	9.0	10.0
	Overall Mean		10.4	10.1	12.0	9.5	8.7	10.1
L. reuteri DS-37	1[c]	4	10.7	10.5	15.0	11.1	8.6	10.2
		6	10.6	10.3	14.4	8.2	8.8	10.2
		11	10.1	9.8	14.4	10.2	8.0	9.7
	Exp. 1 Mean		10.5	10.2	14.6	9.8	8.5	10.0
	2[d]	5	10.5	10.1	10.5	9.9	9.1	9.5
		6	10.5	10.5	10.8	9.8	8.7	9.6
		11	10.2	10.2	9.8	9.6	9.3	10.6
	Exp. 2 Mean		10.4	10.3	10.4	9.8	9.0	9.9
	Overall Mean		10.4	10.2	12.5	9.8	8.8	10.0
L. reuteri WB-72	1[c]	3	10.6	10.6	14.1	7.9	7.2	10.2
		7	10.4	10.4	14.6	10.4	8.2	9.8
		15	9.9	9.6	12.6	6.8	8.3	9.7
	Exp. 1 Mean		10.3	10.2	13.8	8.4	7.9	9.9
	2[d]	7	10.7	10.7	10.6	10.7	9.3	9.7
		8	10.9	10.7	10.4	9.7	9.8	10.0
		9	10.8	10.8	11.0	9.8	9.8	10.4
	Exp. 2 Mean		10.8	10.7	10.7	10.1	9.6	10.0
	Overall Mean		10.6	10.5	12.2	9.2	8.8	10.0
L. reuteri WB-76	1[c]	1	11.1	10.0	12.9	9.3	8.8	10.2
		9	10.5	9.7	15.5	10.5	7.4	9.7
		12	10.3	9.8	13.8	12.1	9.4	10.3
	Exp. 1 Mean		10.6	9.8	14.1	10.6	8.5	10.1
	2[d]	12	10.9	10.8	11.1	9.8	9.7	10.3
		13	10.4	10.7	10.5	9.2	9.1	9.4
		14	11.0	10.6	10.5	8.7	9.4	9.6
	Exp. 2 Mean		10.8	10.7	10.7	9.2	9.4	9.8
	Overall Mean		10.7	10.3	12.4	9.9	9.0	9.9

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C53. Study 2 hourly LPS[a] challenge total protein levels (g/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	5.2	4.7	6.5	4.7	5.3	5.0
		10	4.9	4.4	7.6	6.4	4.5	4.8
		13	5.2	4.8	7.4	5.8	5.0	5.1
	Exp. 1 Mean		5.1	4.6	7.2	5.6	4.9	5.0
	2[d]	1	4.6	4.4	4.4	4.3	4.2	4.5
		3	5.4	5.0	5.1	5.9	5.0	5.1
		15	5.0	4.5	4.1	3.9	4.5	4.3
	Exp. 2 Mean		5.0	4.6	4.5	4.7	4.6	4.6
	Overall Mean		5.1	4.6	5.9	5.2	4.8	4.8
L. reuteri DS-36	1[c]	2	5.4	4.5	7.2	4.1	4.5	4.9
		8	5.1	4.7	7.7	6.3	4.7	5.2
		14	5.2	4.9	6.4	4.5	4.7	4.9
	Exp. 1 Mean		5.2	4.7	7.1	5.0	4.6	5.0
	2	2	5.4	5.2	5.2	5.5	5.5	5.2
		4	4.4	4.2	4.2	4.3	4.3	4.2
		10	4.8	4.4	4.4	4.3	4.2	4.2
	Exp. 2 Mean		4.9	4.6	4.6	4.7	4.7	4.5
	Overall Mean		5.1	4.7	5.9	4.8	4.7	4.8
L. reuteri DS-37	1[c]	4	5.1	4.9	7.5	5.7	4.8	5.0
		6	4.9	4.6	6.9	3.5	4.3	4.9
		11	4.9	4.4	7.3	4.8	4.1	4.7
	Exp. 1 Mean		5.0	4.6	7.2	4.7	4.4	4.9
	2	5	5.4	4.7	4.9	4.6	4.7	4.5
		6	4.9	4.8	4.9	4.6	4.6	4.7
		11	4.8	4.7	4.2	4.3	4.4	4.5
	Exp. 2 Mean		5.0	4.7	4.7	4.5	4.6	4.6
	Overall Mean		5.0	4.7	6.0	4.6	4.5	4.7
L. reuteri WB-72	1[c]	3	5.6	5.2	7.7	4.0	4.7	5.2
		7	4.9	4.5	7.5	5.4	4.5	4.6
		15	4.8	4.3	6.3	3.6	4.7	4.3
	Exp. 1 Mean		5.1	4.7	7.2	4.3	4.6	4.7
	2	7	5.3	5.0	4.8	4.9	4.6	4.7
		8	5.3	5.1	4.4	4.6	4.9	4.9
		9	5.3	4.9	4.9	4.7	5.1	4.9
	Exp. 2 Mean		5.3	5.0	4.7	4.7	4.9	4.8
	Overall Mean		5.2	4.8	5.9	4.5	4.8	4.8
L. reuteri WB-76	1[c]	1	5.3	4.4	6.3	4.7	5.0	4.8
		9	5.5	5.0	8.3	5.4	4.3	5.1
		12	5.3	4.9	7.1	6.9	5.8	5.2
	Exp. 1 Mean		5.4	4.8	7.2	5.7	5.0	5.0
	2[d]	12	5.9	5.1	5.3	4.8	5.2	5.1
		13	4.6	4.8	4.7	4.4	4.3	4.3
		14	4.8	4.5	4.2	3.9	4.3	4.3
	Exp. 2 Mean		5.1	4.8	4.7	4.4	4.6	4.6
	Overall Mean		5.2	4.8	6.0	5.0	4.8	4.8

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C54. Study 2 hourly LPS[a] challenge albumin levels (g/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	3.1	2.7	4.0	2.9	3.1	2.7
		10	3.0	2.7	4.9	4.2	2.7	2.8
		13	2.9	2.6	4.4	3.3	2.8	2.8
	Exp. 1 Mean		3.0	2.7	4.4	3.5	2.9	2.8
	2[d]	1	2.6	2.5	2.6	2.4	2.3	2.6
		3	3.2	2.9	3.0	3.5	2.8	2.8
		15	3.1	2.8	2.5	2.5	2.8	2.5
	Exp. 2 Mean		3.0	2.7	2.7	2.8	2.6	2.6
	Overall Mean		3.0	2.7	3.6	3.1	2.8	2.7
L. reuteri DS-36	1[c]	2	3.3	2.7	4.6	2.6	2.8	2.9
		8	3.3	3.1	5.4	4.4	3.1	3.3
		14	3.6	3.3	4.6	3.1	3.2	3.3
	Exp. 1 Mean		3.4	3.0	4.9	3.4	3.0	3.2
	2[d]	2	3.1	3.1	3.1	3.2	3.2	3.1
		4	2.8	2.6	2.7	2.7	2.6	2.6
		10	3.1	2.8	2.8	2.7	2.6	2.5
	Exp. 2 Mean		3.0	2.8	2.9	2.9	2.8	2.7
	Overall Mean		3.2	2.9	3.9	3.1	2.9	3.0
L. reuteri DS-37	1[c]	4	3.6	3.3	5.3	4.0	3.2	3.3
		6	2.9	2.7	4.3	2.0	2.5	2.8
		11	2.9	2.5	4.5	3.0	2.4	2.7
	Exp. 1 Mean		3.1	2.8	4.7	3.0	2.7	2.9
	2[d]	5	3.1	2.7	2.7	2.7	2.6	2.4
		6	2.6	2.6	2.6	2.5	2.4	2.5
		11	2.4	2.4	2.2	2.3	2.2	2.4
	Exp. 2 Mean		2.7	2.6	2.5	2.5	2.4	2.4
	Overall Mean		2.9	2.7	3.6	2.8	2.6	2.7
L. reuteri WB-72	1[c]	3	3.6	3.4	5.3	2.6	3.2	3.4
		7	3.1	2.9	4.9	3.6	2.9	2.9
		15	2.6	2.3	3.7	2.0	2.6	2.4
	Exp. 1 Mean		3.1	2.9	4.6	2.7	2.9	2.9
	2[d]	7	3.4	3.1	3.1	3.2	2.9	2.9
		8	3.2	3.3	2.8	2.9	2.9	3.0
		9	3.2	2.9	2.9	2.8	3.0	2.8
	Exp. 2 Mean		3.3	3.1	2.9	3.0	2.9	2.9
	Overall Mean		3.2	3.0	3.8	2.9	2.9	2.9
L. reuteri WB-76	1[c]	1	3.3	2.8	4.5	3.0	3.2	2.8
		9	3.3	2.8	5.4	3.4	2.6	3.0
		12	3.2	3.0	4.8	4.6	3.6	3.2
	Exp. 1 Mean		3.3	2.9	4.9	3.7	3.1	3.0
	2[d]	12	3.5	3.1	3.3	3.0	3.1	3.1
		13	2.8	2.8	2.8	2.6	2.4	2.5
		14	3.0	2.8	2.7	2.5	2.7	2.6
	Exp. 2 Mean		3.1	2.9	2.9	2.7	2.7	2.7
	Overall Mean		3.2	2.9	3.9	3.2	2.9	2.9

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C55. Study 2 hourly LPS[a] challenge globulin levels (g/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	2.1	1.9	2.5	1.9	2.2	2.2
		10	1.9	1.7	2.7	2.2	1.8	1.9
		13	2.3	2.2	3.1	2.5	2.2	2.3
	Exp. 1 Mean		2.1	1.9	2.8	2.2	2.1	2.1
	2[d]	1	2.0	1.9	1.8	1.9	1.9	1.9
		3	2.2	2.1	2.1	2.4	2.2	2.3
		15	1.9	1.7	1.6	1.4	1.7	1.8
	Exp. 2 Mean		2.0	1.9	1.8	1.9	1.9	2.0
	Overall Mean		2.1	1.9	2.3	2.1	2.0	2.1
L. reuteri DS-36	1[c]	2	2.1	1.8	2.5	1.5	1.7	2.0
		8	1.8	1.6	2.4	1.9	1.6	1.9
		14	1.6	1.6	1.7	1.4	1.4	1.5
	Exp. 1 Mean		1.8	1.7	2.2	1.6	1.6	1.8
	2[d]	2	2.3	2.1	2.1	2.3	2.3	2.1
		4	1.7	1.6	1.4	1.6	1.6	1.6
		10	1.7	1.6	1.6	1.6	1.6	1.7
	Exp. 2 Mean		1.9	1.8	1.7	1.8	1.8	1.8
	Overall Mean		1.9	1.7	2.0	1.7	1.7	1.8
L. reuteri DS-37	1[c]	4	1.6	1.6	2.2	1.7	1.6	1.7
		6	2.0	1.9	2.5	1.4	1.8	2.1
		11	2.0	1.9	2.8	1.9	1.7	2.0
	Exp. 1 Mean		1.9	1.8	2.5	1.7	1.7	1.9
	2[d]	5	2.3	2.0	2.1	2.0	2.1	2.1
		6	2.3	2.2	2.2	2.1	2.2	2.2
		11	2.4	2.3	2.0	2.0	2.2	2.1
	Exp. 2 Mean		2.3	2.2	2.1	2.0	2.2	2.1
	Overall Mean		2.1	2.0	2.3	1.9	1.9	2.0
L. reuteri WB-72	1[c]	3	2.0	1.7	2.4	1.3	1.5	1.8
		7	1.8	1.7	2.6	1.8	1.6	1.7
		15	2.2	2.0	2.6	1.6	2.0	2.0
	Exp. 1 Mean		2.0	1.8	2.5	1.6	1.7	1.8
	2[d]	7	1.9	1.9	1.7	1.8	1.7	1.8
		8	2.1	1.9	1.6	1.7	1.9	2.0
		9	2.2	2.0	2.0	2.0	2.1	2.1
	Exp. 2 Mean		2.1	1.9	1.8	1.8	1.9	2.0
	Overall Mean		2.0	1.9	2.2	1.7	1.8	1.9
L. reuteri WB-76	1[c]	1	2.0	1.7	1.8	1.7	1.9	2.0
		9	2.2	2.0	2.9	2.0	1.8	2.1
		12	2.1	1.8	2.4	2.3	2.2	2.0
	Exp. 1 Mean		2.1	1.8	2.4	2.0	2.0	2.0
	2[d]	12	2.3	2.0	2.0	1.8	2.1	2.0
		13	1.8	1.9	1.8	1.7	1.8	1.8
		14	1.7	1.7	1.5	1.4	1.6	1.7
	Exp. 2 Mean		1.9	1.9	1.8	1.6	1.8	1.8
	Overall Mean		2.0	1.9	2.1	1.8	1.9	1.9

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C56. Study 2 hourly LPS[a] challenge albumin:globulin ratio levels

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	1.4	1.4	1.6	1.5	1.4	1.2
		10	1.6	1.5	1.8	2.0	1.5	1.5
		13	1.2	1.2	1.4	1.3	1.3	1.3
	Exp. 1 Mean		1.4	1.4	1.6	1.6	1.4	1.3
	2[d]	1	1.3	1.3	1.5	1.2	1.2	1.3
		3	1.4	1.4	1.4	1.5	1.3	1.3
		15	1.6	1.6	1.6	1.7	1.6	1.4
	Exp. 2 Mean		1.4	1.4	1.5	1.5	1.4	1.3
	Overall Mean		1.4	1.4	1.6	1.5	1.4	1.3
L. reuteri DS-36	1[c]	2	1.6	1.5	1.8	1.7	1.6	1.4
		8	1.8	1.9	2.3	2.3	1.9	1.7
		14	2.2	2.0	2.7	2.2	2.2	2.2
	Exp. 1 Mean		1.9	1.8	2.3	2.1	1.9	1.8
	2[d]	2	1.4	1.4	1.5	1.4	1.4	1.5
		4	1.7	1.7	1.9	1.7	1.6	1.7
		10	1.8	1.8	1.8	1.7	1.6	1.5
	Exp. 2 Mean		1.6	1.6	1.7	1.6	1.5	1.6
	Overall Mean		1.8	1.7	2.0	1.8	1.7	1.7
L. reuteri DS-37	1[c]	4	2.3	2.0	2.4	2.3	2.1	1.9
		6	1.4	1.4	1.7	1.4	1.3	1.3
		11	1.5	1.4	1.6	1.6	1.4	1.3
	Exp. 1 Mean		1.7	1.6	1.9	1.8	1.6	1.5
	2[d]	5	1.3	1.3	1.3	1.4	1.2	1.1
		6	1.1	1.2	1.2	1.2	1.1	1.2
		11	1.0	1.1	1.1	1.1	1.0	1.1
	Exp. 2 Mean		1.1	1.2	1.2	1.2	1.1	1.1
	Overall Mean		1.4	1.4	1.6	1.5	1.4	1.3
L. reuteri WB-72	1[c]	3	1.8	2.0	2.2	2.0	2.1	1.8
		7	1.8	1.7	1.9	1.9	1.8	1.8
		15	1.2	1.2	1.5	1.2	1.3	1.2
	Exp. 1 Mean		1.6	1.6	1.9	1.7	1.7	1.6
	2[d]	7	1.8	1.7	1.8	1.8	1.7	1.6
		8	1.6	1.7	1.8	1.7	1.5	1.5
		9	1.4	1.5	1.5	1.4	1.4	1.3
	Exp. 2 Mean		1.6	1.6	1.7	1.6	1.5	1.5
	Overall Mean		1.6	1.6	1.8	1.7	1.6	1.5
L. reuteri WB-76	1[c]	1	1.6	1.6	2.6	1.7	1.7	1.4
		9	1.5	1.5	1.9	1.7	1.5	1.4
		12	1.6	1.7	2.0	1.9	1.7	1.6
	Exp. 1 Mean		1.6	1.6	2.2	1.8	1.6	1.5
	2[d]	12	1.5	1.5	1.6	1.6	1.5	1.6
		13	1.5	1.5	1.6	1.5	1.3	1.4
		14	1.8	1.7	1.8	1.8	1.6	1.5
	Exp. 2 Mean		1.6	1.6	1.7	1.6	1.5	1.5
	Overall Mean		1.6	1.6	1.9	1.7	1.6	1.5

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C57. Study 2 hourly LPS[a] challenge AST[b] levels (U/L)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	45	55	93	80	126	85
		10	49	53	104	100	89	81
		13	54	59	100	90	117	112
	Exp. 1 Mean		49	56	99	90	111	93
	2[e]	1	50	57	67	66	87	70
		3	49	56	60	89	102	101
		15	64	56	70	82	126	119
	Exp. 2 Mean		54	56	66	79	105	97
	Overall Mean		52	56	82	85	108	95
L. reuteri DS-36	1[d]	2	43	45	75	46	96	51
		8	47	61	97	100	98	85
		14	63	64	130	85	101	69
	Exp. 1 Mean		51	57	101	77	98	68
	2[e]	2	43	49	58	74	77	65
		4	48	52	60	66	91	65
		10	48	54	54	64	66	61
	Exp. 2 Mean		46	52	57	68	78	64
	Overall Mean		49	54	79	73	88	66
L. reuteri DS-37	1[d]	4	51	58	94	78	69	50
		6	65	62	98	54	69	68
		11	47	61	98	70	64	61
	Exp. 1 Mean		54	60	97	67	67	60
	2[e]	5	50	51	52	62	77	83
		6	50	63	74	90	122	94
		11	46	59	54	69	87	75
	Exp. 2 Mean		49	58	60	74	95	84
	Overall Mean		52	59	78	71	81	72
L. reuteri WB-72	1[d]	3	50	66	123	79	175	96
		7	45	51	95	77	81	61
		15	57	61	93	60	70	52
	Exp. 1 Mean		51	59	104	72	109	70
	2[e]	7	43	42	68	59	64	55
		8	45	64	63	71	97	65
		9	50	49	52	51	71	56
	Exp. 2 Mean		46	52	61	60	77	59
	Overall Mean		48	56	82	66	93	64
L. reuteri WB-76	1[d]	1	67	74	100	83	105	69
		9	45	53	99	81	101	76
		12	53	55	82	87	74	52
	Exp. 1 Mean		55	61	94	84	93	66
	2[e]	12	53	42	49	62	84	53
		13	100	110	121	128	156	169
		14	55	55	57	64	76	60
	Exp. 2 Mean		69	69	76	85	105	94
	Overall Mean		62	65	85	84	99	80

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]AST - aspartate aminotransferase

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C58. Study 2 hourly LPS[a] challenge ALT[b] levels (U/L)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	39	38	50	45	50	43
		10	61	57	90	78	64	61
		13	56	57	78	65	64	66
	Exp. 1 Mean		52	51	73	63	59	57
	2[e]	1	46	50	49	49	54	47
		3	44	47	46	54	53	52
		15	69	71	67	68	74	69
	Exp. 2 Mean		53	56	54	57	60	56
	Overall Mean		53	53	63	60	60	56
L. reuteri DS-36	1[d]	2	47	48	62	46	54	58
		8	59	56	77	72	61	61
		14	56	53	62	52	57	54
	Exp. 1 Mean		54	52	67	57	57	58
	2[e]	2	43	42	45	45	46	43
		4	59	57	59	59	60	54
		10	46	44	43	48	49	40
	Exp. 2 Mean		49	48	49	51	52	46
	Overall Mean		52	50	58	54	55	52
L. reuteri DS-37	1[d]	4	56	55	77	65	58	54
		6	74	71	90	57	66	68
		11	62	57	84	64	56	57
	Exp. 1 Mean		64	61	84	62	60	60
	2[e]	5	75	69	69	70	73	70
		6	60	62	63	63	69	63
		11	58	62	56	58	61	58
	Exp. 2 Mean		64	64	63	64	68	64
	Overall Mean		64	63	73	63	64	62
L. reuteri WB-72	1[d]	3	48	50	68	49	59	58
		7	66	65	93	74	69	66
		15	70	65	85	54	70	61
	Exp. 1 Mean		61	60	82	59	66	62
	2[e]	7	60	60	61	61	62	58
		8	48	54	47	51	60	52
		9	49	50	47	51	55	46
	Exp. 2 Mean		52	55	52	54	59	52
	Overall Mean		57	57	67	57	63	57
L. reuteri WB-76	1[d]	1	63	62	75	65	69	62
		9	39	41	57	44	43	46
		12	62	59	77	78	66	56
	Exp. 1 Mean		55	54	70	62	59	55
	2[e]	12	47	46	47	48	49	46
		13	52	53	56	58	58	53
		14	63	59	58	58	63	51
	Exp. 2 Mean		54	53	54	55	57	50
	Overall Mean		54	53	62	59	58	52

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]ALT - alanine aminotransferase

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C59. Study 2 hourly LPS[a] challenge ALKPhos[b] levels (U/L)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	273	253	359	235	296	234
		10	219	204	375	279	201	206
		13	239	229	362	254	226	226
	Exp. 1 Mean		244	229	365	256	241	222
	2[e]	1	217	216	214	191	240	206
		3	178	171	174	190	198	168
		15	159	159	153	137	162	128
	Exp. 2 Mean		185	182	180	173	200	167
	Overall Mean		214	205	273	214	221	195
L. reuteri DS-36	1[d]	2	267	225	357	176	229	223
		8	177	161	265	199	148	154
		14	193	216	264	164	184	193
	Exp. 1 Mean		212	201	295	180	187	190
	2	2	236	236	224	226	257	214
		4	197	187	194	179	182	145
		10	343	293	371	327	334	258
	Exp. 2 Mean		259	239	263	244	258	206
	Overall Mean		236	220	279	212	222	198
L. reuteri DS-37	1[d]	4	202	199	322	217	206	173
		6	243	235	354	152	229	231
		11	187	159	306	186	147	153
	Exp. 1 Mean		211	198	327	185	194	186
	2	5	191	177	177	170	168	130
		6	171	174	186	157	160	141
		11	179	180	172	161	177	165
	Exp. 2 Mean		180	177	178	163	168	145
	Overall Mean		196	187	253	174	181	166
L. reuteri WB-72	1[d]	3	283	306	425	188	289	299
		7	189	182	310	205	183	160
		15	235	212	323	148	243	201
	Exp. 1 Mean		236	233	353	180	238	220
	2	7	121	127	116	119	109	98
		8	146	140	141	143	197	224
		9	146	139	139	125	156	121
	Exp. 2 Mean		138	135	132	129	154	148
	Overall Mean		187	184	242	155	196	184
L. reuteri WB-76	1[d]	1	286	222	357	248	332	264
		9	142	138	230	131	118	126
		12	219	213	306	275	246	199
	Exp. 1 Mean		216	191	298	218	232	196
	2[e]	12	172	163	191	162	199	166
		13	236	235	255	216	246	229
		14	186	200	193	154	199	177
	Exp. 2 Mean		198	199	213	177	215	191
	Overall Mean		207	195	255	198	223	194

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]ALKPhos - alkaline phosphatase

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C60. Study 2 hourly LPS[a] challenge bili, total levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0[c]	Hour 1.5[c]	Hour 3.0[c]	Hour 6.0[c]	Hour 12[c]	Hour 24[c]
Control	1[d]	5	0.1	0.1	0.3	0.1	1.0	0.1
		10	0.2	0.1	0.5	0.4	0.6	0.1
		13	0.1	0.1	0.2	0.4	0.9	0.2
	Exp. 1 Mean		0.1	0.1	0.3	0.3	0.8	0.1
	2[e]	1	0.1	0.1	0.1	0.2	0.6	0.1
		3	0.1	0.1	0.1	0.3	0.5	0.1
		15	0.1	0.1	0.1	0.1	0.1	0.1
	Exp. 2 Mean		0.1	0.1	0.1	0.2	0.4	0.1
	Overall Mean		0.1	0.1	0.2	0.3	0.6	0.1
L. reuteri DS-36	1[d]	2	0.2	0.1	0.3	0.1	0.5	0.1
		8	0.1	0.1	0.2	0.1	0.2	0.1
		14	0.6	0.1	0.6	0.2	0.7	0.1
	Exp. 1 Mean		0.3	0.1	0.4	0.1	0.5	0.1
	2[e]	2	0.1	0.1	0.1	0.3	0.3	0.1
		4	0.1	0.1	0.1	0.1	0.2	0.1
		10	0.2	0.3	0.4	0.9	0.8	0.1
	Exp. 2 Mean		0.1	0.2	0.2	0.4	0.4	0.1
	Overall Mean		0.2	0.1	0.3	0.3	0.5	0.1
L. reuteri DS-37	1[d]	4	0.1	0.1	0.4	0.2	0.6	0.1
		6	0.1	0.1	0.3	0.1	0.3	0.1
		11	0.1	0.2	0.2	0.1	0.1	0.1
	Exp. 1 Mean		0.1	0.1	0.3	0.1	0.3	0.1
	2[e]	5	0.3	0.1	0.1	0.1	0.1	0.1
		6	0.1	0.1	0.1	0.1	0.5	0.2
		11	0.1	0.3	0.1	0.2	0.1	0.1
	Exp. 2 Mean		0.2	0.2	0.1	0.1	0.2	0.1
	Overall Mean		0.1	0.2	0.2	0.1	0.3	0.1
L. reuteri WB-72	1[d]	3	0.1	0.1	0.4	0.2	1.0	0.1
		7	0.1	0.1	0.3	0.1	0.4	0.1
		15	0.1	0.1	0.3	0.1	0.5	0.1
	Exp. 1 Mean		0.1	0.1	0.3	0.1	0.6	0.1
	2[e]	7	0.1	0.1	0.2	0.1	0.4	0.1
		8	0.1	0.6	0.2	0.1	0.7	0.2
		9	0.1	0.1	0.1	0.1	0.2	0.1
	Exp. 2 Mean		0.1	0.3	0.2	0.1	0.4	0.1
	Overall Mean		0.1	0.2	0.3	0.1	0.5	0.1
L. reuteri WB-76	1[d]	1	0.3	0.4	0.2	0.2	0.9	0.1
		9	0.2	0.1	0.4	0.1	0.3	0.1
		12	0.1	0.1	0.2	0.2	0.3	0.1
	Exp. 1 Mean		0.2	0.2	0.3	0.2	0.5	0.1
	2[e]	12	0.4	0.1	0.2	0.2	0.5	0.1
		13	0.1	0.2	0.1	0.4	1.0	0.2
		14	0.1	0.1	0.1	0.1	0.2	0.5
	Exp. 2 Mean		0.2	0.1	0.1	0.2	0.6	0.3
	Overall Mean		0.2	0.2	0.2	0.2	0.5	0.2

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]All 0.1 individual pig values were equal to <0.1

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C61. Study 2 hourly LPS[a] challenge cholesterol levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	88	55	107	66	73	74
		10	84	73	124	101	70	77
		13	85	75	122	90	85	86
	Exp. 1 Mean		86	68	118	86	76	79
	2[d]	1	77	68	68	56	62	66
		3	90	79	78	73	55	69
		15	70	60	50[e]	50[e]	50[e]	53
	Exp. 2 Mean		79	69	63	60	56	63
	Overall Mean		82	68	92	73	66	71
L. reuteri DS-36	1[c]	2	84	69	109	50[e]	56	71
		8	84	73	118	90	71	72
		14	89	91	110	70	75	84
	Exp. 1 Mean		86	78	112	70	67	76
	2[d]	2	95	90	89	85	83	73
		4	57	52	52	50[e]	50[e]	50[e]
		10	81	67	70	58	59	58
	Exp. 2 Mean		78	70	70	64	64	60
	Overall Mean		82	74	91	67	66	68
L. reuteri DS-37	1[c]	4	73	67	103	43	56	61
		6	50[e]	50[e]	73	50[e]	53	56
		11	64	50	95	52	50[e]	53
	Exp. 1 Mean		62	56	90	48	53	57
	2[d]	5	85	75	71	50	50[e]	50[e]
		6	84	80	79	65	69	66
		11	72	70	62	55	59	68
	Exp. 2 Mean		80	75	71	57	64	61
	Overall Mean		71	65	81	53	57	59
L. reuteri WB-72	1[c]	3	90	84	120	53	77	82
		7	84	79	129	87	71	72
		15	87	77	113	52	74	65
	Exp. 1 Mean		87	80	121	64	74	73
	2[d]	7	68	64	55	50[e]	50[e]	50[e]
		8	71	61	52	50[e]	50[e]	63
		9	70	61	58	50[e]	57	50[e]
	Exp. 2 Mean		70	62	55	50	52	54
	Overall Mean		78	71	88	57	63	64
L. reuteri WB-76	1[c]	1	90	67	102	75	84	72
		9	86	76	116	65	55	71
		12	78	73	105	88	77	81
	Exp. 1 Mean		85	72	108	76	72	75
	2[d]	12	97	85	87	67	75	61
		13	68	67	65	53	52	68
		14	50[e]	50[e]	50[e]	50[e]	50[e]	67
	Exp. 2 Mean		72	67	67	57	59	65
	Overall Mean		78	70	88	66	66	70

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

[e]Values were equal to <50

Table C62. Study 2 hourly LPS[a] challenge triglyceride levels (mg/dL)

Treatment[b]	Exp.[b]	Pig[b]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[c]	5	31	25	40	19	51	25
		10	42	33	45	30	48	31
		13	39	48	65	56	111	41
	Exp. 1 Mean		37	35	50	35	70	32
	2[d]	1	50	34	33	31	91	69
		3	41	33	35	46	71	45
		15	62	48	50	34	47	57
	Exp. 2 Mean		51	38	39	37	70	57
	Overall Mean		44	37	45	36	70	45
L. reuteri DS-36	1[c]	2	35	30	40	17	51	23
		8	18	17	33	14	18	23
		14	43	34	38	27	79	73
	Exp. 1 Mean		32	27	37	19	49	40
	2[d]	2	51	43	44	48	59	43
		4	38	33	25	25	35	28
		10	27	33	46	38	68	27
	Exp. 2 Mean		39	36	38	37	54	33
	Overall Mean		35	32	38	28	52	36
L. reuteri DS-37	1[c]	4	36	28	45	26	40	35
		6	29	21	35	14	52	23
		11	37	26	39	18	18	28
	Exp. 1 Mean		34	25	40	19	37	29
	2[d]	5	48	53	45	26	38	29
		6	32	36	28	23	47	28
		11	47	42	31	23	34	58
	Exp. 2 Mean		42	44	35	24	40	38
	Overall Mean		38	34	37	22	38	34
L. reuteri WB-72	1[c]	3	29	36	51	16	91	34
		7	24	32	39	20	30	14
		15	45	35	52	27	56	40
	Exp. 1 Mean		33	34	47	21	59	29
	2[d]	7	36	24	24	24	31	24
		8	37	40	29	31	61	52
		9	37	26	31	25	55	35
	Exp. 2 Mean		37	30	28	27	49	37
	Overall Mean		35	32	38	24	54	33
L. reuteri WB-76	1[c]	1	39	17	39	24	99	31
		9	46	29	52	11	20	28
		12	20	20	25	18	27	20
	Exp. 1 Mean		35	22	39	18	49	26
	2[d]	12	69	56	52	38	114	35
		13	33	34	35	29	42	29
		14	40	28	30	23	44	62
	Exp. 2 Mean		47	39	39	30	67	42
	Overall Mean		41	31	39	24	58	34

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]Description of treatments, experiments, and pigs - see Table C2

[c]Experiment 1 were gilts

[d]Experiment 2 were barrows

Table C63. Study 2 hourly LPS[a] challenge HDL[b] levels (mg/dL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	32	27	37	18	14	17
		10	28	24	45	29	21	26
		13	27	25	28	24	22	25
	Exp. 1 Mean		29	25	37	24	19	23
	2[e]	1	30	28	26	16	18	26
		3	33	30	28	21	11	11
		15	31	27	23	15	16	17
	Exp. 2 Mean		31	28	26	17	15	18
	Overall Mean		30	27	31	21	17	20
L. reuteri DS-36	1[d]	2	26	20	33	13	11	14
		8	30	26	44	27	21	24
		14	31	32	39	20	19	26
	Exp. 1 Mean		29	26	39	20	17	21
	2[e]	2	35	33	31	30	28	24
		4	24	23	22	14	11	9
		10	30	25	27	17	13	11
	Exp. 2 Mean		30	27	27	20	17	15
	Overall Mean		29	27	33	20	17	18
L. reuteri DS-37	1[d]	4	26	23	36	20	15	17
		6	17	15	24	10	16	19
		11	26	21	38	17	10	16
	Exp. 1 Mean		23	20	33	16	14	17
	2[e]	5	42	37	36	23	13	9
		6	31	29	29	18	12	9
		11	26	24	22	17	14	20
	Exp. 2 Mean		33	30	29	19	13	13
	Overall Mean		28	25	31	18	13	15
L. reuteri WB-72	1[d]	3	32	30	43	16	19	26
		7	24	23	37	20	14	12
		15	27	24	36	15	17	15
	Exp. 1 Mean		28	26	39	17	17	18
	2[e]	7	27	26	23	16	9	7
		8	27	22	21	15	9	15
		9	27	24	22	16	18	13
	Exp. 2 Mean		27	24	22	16	12	12
	Overall Mean		27	25	30	16	14	15
L. reuteri WB-76	1[d]	1	26	19	29	19	20	16
		9	30	26	40	19	17	24
		12	25	23	33	23	19	24
	Exp. 1 Mean		27	23	34	20	19	21
	2[e]	12	37	34	35	22	23	17
		13	24	23	22	12	9	9
		14	19	18	16	9	10	11
	Exp. 2 Mean		27	25	24	14	14	12
	Overall Mean		27	24	29	17	16	17

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]HDL - high-density lipoprotein

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C64. Study 2 hourly LPS[a] challenge VLDL[b] levels (mg/dL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	6	5	8	4	10	5
		10	8	7	9	6	10	6
		13	8	10	13	11	22	8
	Exp. 1 Mean		7	7	10	7	14	6
	2[e]	1	10	7	7	6	18	14
		3	8	7	7	9	14	9
		15	12	10	10	7	9	11
	Exp. 2 Mean		10	8	8	7	14	11
	Overall Mean		9	8	9	7	14	9
L. reuteri DS-36	1[d]	2	7	6	8	3	10	5
		8	4	3	7	3	4	5
		14	9	7	8	5	16	15
	Exp. 1 Mean		7	5	8	4	10	8
	2[e]	2	10	9	9	10	12	9
		4	8	7	5	5	7	6
		10	5	7	9	8	14	5
	Exp. 2 Mean		8	8	8	8	11	7
	Overall Mean		7	7	8	6	11	8
L. reuteri DS-37	1[d]	4	7	6	9	5	8	7
		6	6	4	7	3	10	5
		11	7	5	8	4	4	6
	Exp. 1 Mean		7	5	8	4	7	6
	2[e]	5	10	11	9	5	8	6
		6	6	7	6	5	9	6
		11	9	8	6	5	7	12
	Exp. 2 Mean		8	9	7	5	8	8
	Overall Mean		8	7	8	5	8	7
L. reuteri WB-72	1[d]	3	6	7	10	3	18	7
		7	5	6	8	4	6	3
		15	9	7	10	5	11	8
	Exp. 1 Mean		7	7	9	4	12	6
	2[e]	7	7	5	5	5	6	5
		8	7	8	6	6	12	10
		9	7	5	6	5	11	7
	Exp. 2 Mean		7	6	6	5	10	7
	Overall Mean		7	6	8	5	11	7
L. reuteri WB-76	1[d]	1	8	3	8	5	20	6
		9	9	6	10	2	4	6
		12	4	4	5	4	5	4
	Exp. 1 Mean		7	4	8	4	10	5
	2[e]	12	14	11	10	8	23	7
		13	7	7	7	6	8	6
		14	8	6	6	5	9	12
	Exp. 2 Mean		10	8	8	6	13	8
	Overall Mean		8	6	8	5	12	7

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]VLDL - very low-density lipoprotein

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C65. Study 2 hourly LPS[a] challenge IgA[b] levels (mg/mL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	0.257	0.281	0.406	0.347	0.302	1.147
		10	0.265	0.254	0.301	0.278	0.418	0.692
		13	0.305	0.265	0.315	0.285	0.443	2.095
	Exp. 1 Mean		0.275	0.267	0.341	0.304	0.387	1.311
	2[e]	1	0.261	0.366	0.455	0.288	0.359	0.669
		3	0.269	0.308	0.541	0.405	0.586	0.773
		15	0.749	0.577	0.463	0.515	0.621	0.558
	Exp. 2 Mean		0.426	0.417	0.486	0.403	0.522	0.666
	Overall Mean		0.351	0.342	0.414	0.353	0.455	0.989
L. reuteri DS-36	1[d]	2	0.306	0.256	0.299	0.305	0.247	0.635
		8	0.350	0.283	0.410	0.575	0.283	0.985
		14	0.249	0.547	0.305	0.249	0.385	0.596
	Exp. 1 Mean		0.302	0.362	0.338	0.376	0.305	0.739
	2[e]	2	0.389	0.496	1.054	0.634	0.621	0.550
		4	0.368	0.760	0.662	0.592	0.548	0.825
		10	0.490	0.544	0.393	0.685	0.652	0.594
	Exp. 2 Mean		0.416	0.600	0.703	0.637	0.607	0.656
	Overall Mean		0.359	0.481	0.521	0.506	0.456	0.697
L. reuteri WB-37	1[d]	4	0.245	0.307	0.332	0.281	0.251	0.372
		6	0.275	0.243	0.369	0.303	0.202	0.543
		11	0.349	0.227	0.264	0.259	0.373	0.425
	Exp. 1 Mean		0.290	0.259	0.322	0.281	0.275	0.447
	2[e]	5	0.273	0.448	0.607	0.373	0.658	0.494
		6	0.705	0.403	0.924	0.564	0.633	0.585
		11	0.400	0.524	0.501	0.472	0.976	0.804
	Exp. 2 Mean		0.459	0.458	0.677	0.470	0.756	0.628
	Overall Mean		0.374	0.359	0.499	0.375	0.515	0.537
L. reuteri WB-72	1[d]	3	0.340	0.274	0.255	0.237	0.232	0.406
		7	0.253	0.242	0.411	0.318	0.287	0.528
		15	0.275	0.368	0.349	0.309	0.486	0.516
	Exp. 1 Mean		0.289	0.295	0.338	0.288	0.335	0.483
	2[e]	7	0.624	0.429	0.671	0.480	0.780	0.678
		8	0.267	0.361	0.413	0.381	0.283	0.412
		9	0.264	0.657	0.723	0.657	0.766	0.556
	Exp. 2 Mean		0.385	0.482	0.602	0.506	0.610	0.549
	Overall Mean		0.337	0.388	0.470	0.397	0.472	0.516
L. reuteri WB-76	1[d]	1	0.424	0.343	0.377	0.244	0.401	1.049
		9	0.371	0.286	0.404	0.323	1.150	0.988
		12	0.271	0.218	0.307	0.278	0.846	0.429
	Exp. 1 Mean		0.355	0.282	0.363	0.282	0.799	0.822
	2[e]	12	0.359	0.359	0.382	0.504	0.819	0.643
		13	0.301	0.540	0.544	0.647	0.795	0.467
		14	0.554	0.356	0.399	0.538	0.558	0.538
	Exp. 2 Mean		0.405	0.418	0.441	0.563	0.724	0.549
	Overall Mean		0.380	0.350	0.402	0.422	0.761	0.686

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]IgA - immunoglobulin A

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C66. Study 2 hourly LPS[a] challenge IgG[b] levels (mg/mL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	11.400	9.382	8.735	5.075	5.407	10.670
		10	5.711	5.570	3.627	2.264	8.491	8.146
		13	8.725	8.299	4.744	4.600	10.560	11.780
	Exp. 1 Mean		8.612	7.750	5.702	3.980	8.153	10.199
	2[e]	1	5.412	4.980	6.991	3.399	4.848	3.995
		3	7.629	5.873	9.679	9.447	8.110	4.525
		15	4.619	7.344	3.338	3.602	3.824	7.021
	Exp. 2 Mean		5.887	6.066	6.669	5.483	5.594	5.180
	Overall Mean		7.249	6.908	6.186	4.731	6.873	7.690
L. reuteri DS-36	1[d]	2	7.230	4.696	5.100	3.120	2.626	10.050
		8	7.151	6.224	3.314	3.305	3.811	9.885
		14	6.105	5.037	3.618	4.055	7.231	14.530
	Exp. 1 Mean		6.829	5.319	4.011	3.493	4.556	11.488
	2[e]	2	8.239	4.749	6.155	5.647	4.516	4.762
		4	2.855	2.990	2.860	3.016	2.657	12.370
		10	4.275	4.261	3.282	4.742	4.040	5.887
	Exp. 2 Mean		5.123	4.000	4.099	4.468	3.738	7.673
	Overall Mean		5.976	4.660	4.055	3.981	4.147	9.581
L. reuteri WB-37	1[d]	4	14.350	5.018	4.942	3.469	2.920	7.345
		6	10.440	7.728	7.539	4.375	4.714	11.720
		11	6.990	6.440	3.450	3.786	8.247	7.573
	Exp. 1 Mean		10.593	6.395	5.310	3.877	5.294	8.879
	2[e]	5	5.754	5.333	6.484	3.817	4.358	7.669
		6	6.289	5.421	7.026	4.078	4.411	6.745
		11	4.879	5.441	3.537	5.341	5.504	8.963
	Exp. 2 Mean		5.641	5.398	5.682	4.412	4.758	7.792
	Overall Mean		8.117	5.897	5.496	4.144	5.026	8.336
L. reuteri WB-72	1[d]	3	9.288	6.321	5.128	3.632	3.579	8.962
		7	5.221	4.277	3.452	3.365	4.744	6.985
		15	8.523	5.110	3.538	4.964	11.690	8.056
	Exp. 1 Mean		7.677	5.236	4.039	3.987	6.671	8.001
	2[e]	7	6.921	6.973	7.330	4.482	3.905	7.148
		8	5.905	6.152	6.635	4.012	3.622	8.934
		9	4.614	5.415	4.316	4.082	5.161	8.585
	Exp. 2 Mean		5.813	6.180	6.094	4.192	4.229	8.222
	Overall Mean		6.745	5.708	5.067	4.090	5.450	8.112
L. reuteri WB-76	1[d]	1	4.790	6.120	5.198	2.809	3.037	6.137
		9	7.474	10.640	4.376	3.114	11.300	12.830
		12	8.149	8.775	4.069	4.393	8.973	12.470
	Exp. 1 Mean		6.804	8.512	4.548	3.439	7.770	10.479
	2[e]	12	6.076	6.556	4.018	4.232	6.088	7.635
		13	4.930	5.735	3.890	4.647	4.837	7.604
		14	4.271	5.086	2.816	3.695	7.899	5.997
	Exp. 2 Mean		5.092	5.792	3.575	4.191	6.275	7.079
	Overall Mean		5.948	7.152	4.061	3.815	7.022	8.779

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]IgG - immunoglobulin G

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

Table C67. Study 2 hourly LPS[a] challenge IgM[b] levels (mg/mL)

Treatment[c]	Exp.[c]	Pig[c]	Hour 0	Hour 1.5	Hour 3.0	Hour 6.0	Hour 12	Hour 24
Control	1[d]	5	1.639	1.438	1.647	0.931	0.993	2.117
		10	2.067	1.989	1.392	1.100	3.765	3.989
		13	3.407	2.825	2.242	1.576	4.647	5.249
	Exp. 1 Mean		2.371	2.084	1.760	1.202	3.135	3.785
	2[e]	1	1.124	0.850	0.831	0.758	1.042	1.538
		3	1.818	1.445	1.263	3.817	2.009	2.123
		15	1.222	1.271	1.197	1.186	1.378	1.498
	Exp. 2 Mean		1.388	1.189	1.097	1.920	1.476	1.720
	Overall Mean		1.880	1.636	1.429	1.561	2.306	2.752
L. reuteri DS-36	1[d]	2	1.586	1.493	1.648	0.945	0.990	3.699
		8	1.147	1.194	0.674	0.506	0.786	2.022
		14	1.621	1.442	1.066	0.847	2.679	2.852
	Exp. 1 Mean		1.451	1.376	1.129	0.766	1.485	2.858
	2[e]	2	1.665	1.267	1.260	1.877	1.841	1.293
		4	1.531	1.091	1.270	1.703	1.932	1.939
		10	0.305	0.875	0.922	1.123	2.321	1.363
	Exp. 2 Mean		1.167	1.078	1.151	1.568	2.031	1.532
	Overall Mean		1.309	1.227	1.140	1.167	1.758	2.195
L. reuteri WB-37	1[d]	4	2.479	1.837	1.840	1.131	1.130	3.287
		6	1.993	1.897	1.644	0.974	1.220	3.386
		11	1.865	1.444	0.903	0.864	2.499	2.512
	Exp. 1 Mean		2.112	1.726	1.462	0.990	1.616	3.062
	2[e]	5	1.250	0.895	0.967	0.840	0.980	1.120
		6	3.025	2.722	1.605	2.821	4.033	2.731
		11	1.289	1.057	1.371	3.370	2.121	1.897
	Exp. 2 Mean		1.855	1.558	1.314	2.344	2.378	1.916
	Overall Mean		1.984	1.642	1.388	1.667	1.997	2.489
L. reuteri WB-72	1[d]	3	2.559	1.446	1.264	0.937	0.994	2.604
		7	1.700	1.557	1.313	1.222	1.164	3.136
		15	1.883	1.737	1.337	1.487	6.008	3.468
	Exp. 1 Mean		2.047	1.580	1.305	1.215	2.722	3.069
	2[e]	7	1.633	1.632	1.185	1.501	1.621	1.695
		8	0.833	0.681	0.582	0.856	0.670	1.027
		9	0.871	1.004	1.358	1.447	1.960	1.525
	Exp. 2 Mean		1.112	1.106	1.042	1.268	1.417	1.416
	Overall Mean		1.580	1.343	1.173	1.242	2.069	2.243
L. reuteri WB-76	1[d]	1	2.138	2.947	2.815	1.656	1.704	7.571
		9	1.215	1.515	0.855	0.632	2.488	3.156
		12	2.636	2.844	1.627	1.401	3.629	4.427
	Exp. 1 Mean		1.996	2.435	1.766	1.230	2.607	5.051
	2[e]	12	1.247	1.026	1.158	1.331	1.911	1.552
		13	2.332	1.878	2.348	2.376	2.820	2.906
		14	1.209	1.133	0.981	1.214	2.127	1.449
	Exp. 2 Mean		1.596	1.346	1.496	1.640	2.286	1.969
	Overall Mean		1.796	1.891	1.631	1.435	2.447	3.510

[a]LPS - *Escherichia coli* O111:B4 lipopolysaccharide

[b]IgM - immunoglobulin M

[c]Description of treatments, experiments, and pigs - see Table C2

[d]Experiment 1 were gilts

[e]Experiment 2 were barrows

APPENDIX D

ADAPTED BLOOD VALUES OF SWINE

Table D1. Adapted complete metabolic profile values for swine

Analyte	Units	Ranges	Reference(s)[a]
Glucose	mg/dL	81.72 - 150.00	1, 2, 3, 4, 6, 7
BUN[b]	mg/dL	8.70 - 30.00	1, 2, 3, 4, 5, 7
Creatinine	mg/dL	0.91 - 2.70	2, 4, 5
BUN:Creatinie ratio		NA[c]	
Sodium	mEq/L	133 - 165	1, 3, 7
Potassium	mEq/L	4.8 - 7.2	1, 2, 3, 7
Chloride	mEq/L	93 - 109	1, 2, 3, 6, 7
Carbon dioxide	mEq/L	20.9 - 26.1	1
Anion gap		16.8 - 19.4	3
Calcium	mg/dL	9.4 - 12.5	2, 3, 4, 5, 6, 8
Total protein	g/dL	4.40 - 8.90	2, 3, 4, 5, 7
Albumin	g/dL	2.2 - 7.6	2, 3, 4, 5, 7
Globulin	g/dL	5.29 - 6.43	2
Albumin:Globulin ratio		0.6 - 1.4	2, 4
AST[d]	U/L	25.0 - 134.5	2, 3, 4, 5
ALT[e]	U/L	18.0 - 46.6	2, 4, 5
ALKPhos[f]	U/L	88 - 689	3, 4, 5, 7
Bili, total	mg/dL	0.0363 - 1.000	2, 3, 4, 5, 7

[a]Numbers refer to refernces listed on next page.

[b]BUN - blood urea nitrogen

[c]NA - Not Available

[d]AST - aspartate aminotransferase

[e]ALT - alanine aminotransferase

[f]ALKPhos - alkaline phosphatase

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Table D2. Adapted lipid panel values for swine

Analyte	Units	Ranges	Reference(s)[a]
Cholesterol	mg/dL	51.69 - 145.00	1, 2, 3, 4, 5
Triglycerides	mg/dL	27.11 - 28.49	5
HDL[b]	mg/dL	8.83 - 12.17	5
VLDL[c]	mg/dL	5.33 - 5.61	5

[a]Numbers refer to refernces listed on next page.

[b]HDL - high-density lipoprotein

[c]VLDL - very low-density lipoprotein

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Table D3. Adapted immunoglobulins for swine

Ig[a]	Units	Range	Reference(s)[b]
IgA[c]	mg/mL	0.369 - 0.609	1, 2
IgG[d]	mg/mL	4.980 - 7.904	1, 2
IgM[e]	mg/mL	1.735 - 4.440	1, 2

[a]Ig - Immunoglobulin

[b]Numbers refer to refernces listed on next page.

[c]IgA - Immunoglobulin A

[d]IgG - Immunoglobulin G

[e]IgM - Immunoglobulin M

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VITA

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Thesis: INFLUENCE OF DIFFERENT CULTURES OF LACTOBACILLI ON GROWTH AND PERFORMANCE, BLOOD CHEMISTRY AND IMMUNE RESPONSE OF NURSERY PIGS

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Major Field: Food Science

Scope and Method of Study: The purpose was to investigate the effects of different cultures of lactobacilli on performance along with blood chemistry and immune response in nursery pigs. A total of sixty crossbred nursery pigs were divided into two studies with a control group and four treatment groups per experiment. This resulted in a total of eight different cultures being tested. Growth and performance was measured for each pigs as well as various blood chemistry analytes and serum immunoglobulins. Also, the subsequent effects of the cultures following a lipopolysaccharide challenge were tested where immunoglobulins, rectal temperatures, and blood chemistry were monitored.

Findings and Conclusions: The results for each study were highly variable. Cultures *L. reuteri* DS-33 and DS-36 and *L. acidophilus* L-23 tended to cause a more efficient feed conversion. Culture L-23 caused a higher total serum protein level than observed in the control group. Pigs fed culture DS-33 had a higher AST level than did the control group. The serum levels of IgA, IgG, and IgM were increased during the feeding period by the cultures WB-74, L-23, and WB-72, respectively. Pigs fed DS-37 had lower levels of serum triglyceride, VLDL, and total bilirubin at hour 12 post challenge as well as a lower temperature at hour 3.0 post challenge than did the control pigs. Albumin:globulin ratio was lower in the control pigs when compared to pigs fed cultures DS-36 and WB-76 at hour 3.0 post challenge.

ADVISER'S APPROVAL: Dr. Stanley E. Gilliland