

Short communication

Performance of rats orogastrically dosed with faecal strains of *Lactobacillus acidophilus* and challenged with *Escherichia coli*

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Accepted 20 June, 2004

Albino rats (*Rattus norvegicus*) were orogastrically dosed with faecal strains of *Lactobacillus acidophilus* and simultaneously infected with *Escherichia coli*, while the control was challenged with *E. coli* alone. The treatment was repeated the second day and post ingestion period of 18 days follow. It was observed that rats dosed with *L. acidophilus* and simultaneously challenged with *E. coli* treatments have better performances when compared with the control for daily weight gain, total weight gain and feed conversion rate. Faecal materials of rats dosed and challenged do not show sign of diarrhoea which was observed in the *E. coli* only treated rats.

Key words: Rats, orogastric, *Lactobacillus acidophilus*.

INTRODUCTION

Probiotics have been defined as "live microbial organisms" which when consumed in adequate amounts confer a health effect on the host (Guarner and Schaafsma, 1998). Probiotics are substituted for antibiotics in treating farm animals with the purpose of preventing intestinal infections, promoting growth rate, and increasing the efficiency of feed conversion (King, 1968).

The genera, *Lactobacillus* and *Bifidobacterium*, which are normal residents of the complex ecosystem of the gastrointestinal tract, are mainly used as probiotics (Mitsuoka, 1992). The choice of *Lactobacilli* as probiotic agent is appropriate since the normal gastrointestinal microbiota of man and animals is rich in this organism (Sandine, 1974).

Lactobacilli as probiotic organism possess some important properties. These include the ability to adhere to host cells, to exclude or reduce pathogenic bacteria, and to produce acids, hydrogen peroxide, and bacteriocins antagonistic to the growth of pathogens (Chang et al., 2001). The presence of *Lactobacilli* in the gut is considered to have several potential benefits such

as: prevention of gastrointestinal infections (Tannock et al., 1988), enhance immune response (Kimura et al., 1997; Aattaouri et al., 2001), growth promotion of farm animals (Baird, 1977) and antimutagenic and anticarcinogenic activity (Fuller and Gibson, 1997).

The present study is aimed at evaluating the weight gain, feed conversion rate, and faecal characteristics of rats fed faecal strains of *L. acidophilus* and simultaneously challenged with *Escherichia coli*.

MATERIALS AND METHODS

The method described by Oyetayo et al. (2003) was used for large scale cultivation of faecal strains of *L. acidophilus*. The concentration of the cultivated cells was determined by serial dilution techniques (Taylor, 1962).

Sixteen (16) albino rats aged 5 to 6 weeks were randomly assigned to four treatments designated AF, BF, PF, and C. of four rats each. Treatment AF, BF, and PF received 0.3 ml of 10^{10} cfu/ml of faecal strains of *L. acidophilus* from albino rats, human nonate and pig, respectively, and 0.3ml of 10^5 cfu/ml of *E. coli*. The control, Treatment C, received only *E. coli* of the same concentration above. Enterotoxigenic strain of *E. coli* was obtained from the

culture collection of department of microbiology, Obafemi Awolowo University, Ile Ife. The treatment above was repeated again the second day. A post ingestion period 18 days was observed after the administration of the treatment. The rats were placed on basal diet purchased from Bendel feed, Edo State, Nigeria throughout the 20 days of the trials.

Daily feed intake, total feed intake, total weight gain, and feed conversion rate were recorded. The faecal characteristics, mainly colour and texture were also observed. Data collected from feed consumed, total weight gain, and feed conversion rate were processed using one-way analysis of variance (ANOVA) SPSS version 10.0. The level of significance was set at $P < 0.05$. Dunnett T-tests compared means.

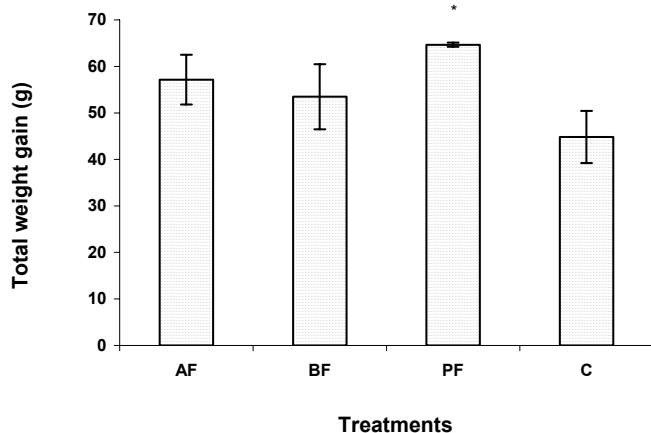


Figure 1. Total weight gain of rats during in vivo feeding trial. *Weight of PF is higher and significantly different ($P < 0.05$) from control (C). AF: Rats dosed with faecal strain of *L. acidophilus* from albino rat and challenged with *E. coli*. BF: Rats dosed with faecal strain of *L. acidophilus* from human neonate and challenged with *E. coli*. PF: Rats dosed with faecal strain of *L. acidophilus* from pig and challenged with *E. coli*. C: Rats challenged with *E. coli* alone.

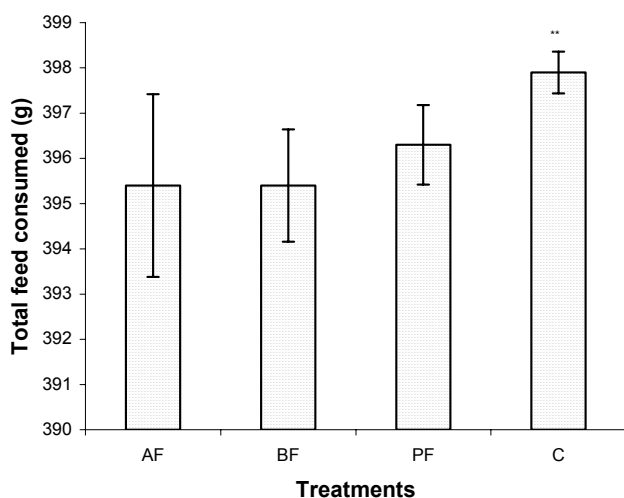


Figure 2. Feed consumed by rats during in vivo feeding trial. **Value of C is higher and significant different ($P < 0.05$) from other treatments. AF: Rats dosed with faecal strain of *L. acidophilus* from albino rat and challenged with *E. coli*. BF: Rats dosed with faecal strain of *L. acidophilus* from human neonate and challenged with *E. coli*. PF: Rats dosed with faecal strain of *L. acidophilus* from pig and challenged with *E. coli*. C: Rats challenged with *E. coli* alone.

Table 1. Effect on the daily growth performance in rats during in vivo feeding with faecal strain of *L. acidophilus*.

Treatments	Daily Weight	Feed consumed
AF	2.86 ± 0.30	18.89 ± 0.46
BF	2.67 ± 0.35	19.09 ± 0.31
PF	3.24 ± 0.04*	8.60 ± 0.60
C	2.24 ± 0.49	19.51 ± 0.27

*Value higher and significantly different ($P < 0.05$) from control (C).

AF: Rats dosed with faecal strain of *L. acidophilus* from albino rat and challenged with *E. coli*.

BF: Rats dosed with faecal strain of *L. acidophilus* from human neonate and challenged with *E. coli*.

PF: Rats dosed with faecal strain of *L. acidophilus* from pig and challenged with *E. coli*.

C: Rats challenged with *E. coli* alone.

RESULTS AND DISCUSSION

The total weight gain (DWG) of the rats dosed with faecal strains of *L. acidophilus* and simultaneously challenged with *E. coli*, were higher (53.50g to 64.67g) compared to the control (44.83g) that was challenged with *E. coli* alone (Figure 1). Moreover, the rats in treatments AF, BF, and PF consumed less feed (395.40 to 396.33 g) compared with the control (C) that consumed 397.90 g of feed (Figure 2). Chang et al. (2001) observed a similar result in piglets. They reported differences between probiotic groups and control group that was placed on basal diet alone.

Probiotics had been used as growth promoters to replace the widely used antibiotic and synthetic chemical feed supplements (Fuller, 1989). This has been possible by their ability to inhibit the presence of growth depressing microflora and also by enhancing absorption of nutrients through the production of digestive enzymes. Table 1 also shows that the group fed faecal strain of *L. acidophilus* had a better growth performance when compared with the control (C) based on the daily weight gain and feed consumed. Bairds (1977) obtained an increase in daily weight gain and an improvement in feed conversion in separate experiments with feeder pigs and growing finishing pigs using a *Lactobacillus* supplement. Here also, it can be stated that the faecal strains of *L. acidophilus* promoted the growth of the rats since in treatments AF, BF, and PF had higher total weight gain (TWG) and daily weight gain (DWG) when compared to the control (C).

The probiotic groups also had a better feed conversion rate (FCR) than the control (C) (Figure 3). This result indicated that in terms of feed consumption, the probiotic groups consumed 22.09% (AF), 16.73% (BF) and 30.95% (PF) less than the control group (C) to achieve the same weight. Chang et al. (2001) reported a similar observation in piglets fed probiotic strain, *Lactobacillus reuteri* BSA 131. Francisco et al. (1995) had earlier reported that selected probiotic strain had an increasing effect on feed conversion rate (FCR) in piglets.

Table 2. Faecal characteristics of rats during *in vivo* feeding trials.

Treatments	Colour	Texture	Remarks
AF	Light brown	Soft and moist	No diarrhoea (0/4)
BF	Light brown	Soft and moist	No diarrhoea (0/4)
PF	Light brown	Soft and moist	No diarrhoea (0/4)
C	Light brown	Wet loose faeces	Sign of diarrhoea (4/4)

AF: Rats dosed with faecal strain of *L. acidophilus* from albino rat and challenged with *E. coli*.

BF: Rats dosed with faecal strain of *L. acidophilus* from human neonate and challenged with *E. coli*.

PF: Rats dosed with faecal strain of *L. acidophilus* from pig and challenged with *E. coli*.

C: Rats challenged with *E. coli* alone.

0/4: No rat in the treatment passed out diarrhoeic faeces.

4/4: All the rats in the treatment passed out diarrhoeic faeces after infection with *E. coli* alone.

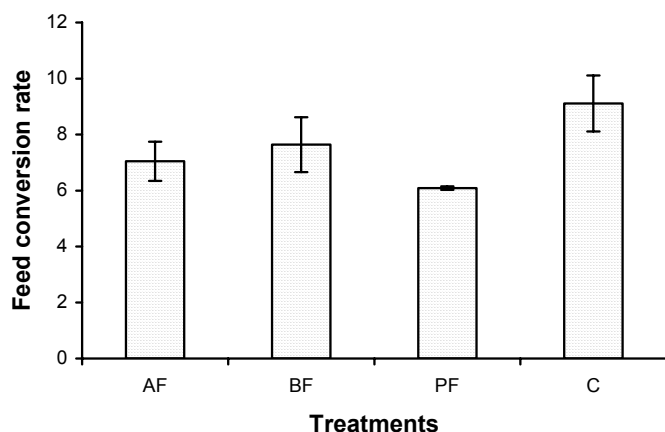


Figure 3. Feed conversion rate of rats during *in vivo* feeding trial. AF: Rats dosed with faecal strain of *L. acidophilus* from albino rat and challenged with *E. coli*. BF: Rats dosed with faecal strain of *L. acidophilus* from human neonate and challenged with *E. coli*. PF: Rats dosed with faecal strain of *L. acidophilus* from pig and challenged with *E. coli*. C: Rats challenged with *E. coli* alone.

Cases of diarrhoeic faeces were observed in the control (C), which was not seen in the groups dosed with probiotic *L. acidophilus* (Table 2). Zani et al. (1998) had also reported a similar observation in pig. These authors reported a reduction in the prevalence of pig diarrhoea during the suckling phase when they used a probiotic, Cenbiot, compounded from *Bacillus species*. Some probiotic *Lactobacillus* strains have been successfully used in the dairy industry to reduce the incidence of traveller's diarrhoea (Oksanen et al., 1990) and to promote recovery from acute diarrhoea (Isolauri et al., 1991).

This report encourage the use of faecal strains of *L. acidophilus* as alternative to the use of antibiotics since they can enhance the performance of animals and also prevent the incidence of diarrhoea associated with bacterial infection.

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