EFFECTS OF DIETARY PROBIOTIC SUPPLEMENTATION ON CHOLESTEROL AND TRIGLYCERIDE LEVELS IN BROILER CHICKS' SERA

M. Mayahi[1], M. Razi Jalali[1] and R. Kiani[2]
[1]Faculty of Veterinary Medicine, Shahid Chamran University, [2]Postgraduate student of Avian Medicine, Faculty of Veterinary Medicine, Shahid Chamran University, Ahvaz, Iran, P.O.Box: 61355-145
Rezvan.Kiani@gmail.com

Abstract

The aim of this study was to investigate the effect of two commercially-available probiotics based on *Enterococcus faecium* and *Bifidobacterium* genera on cholesterol and triglyceride amounts of broiler chicks' sera. One hundred and fifty-six, day-old, Ross chicks were randomly divided into groups A, B, and C (52 each). The birds in group A received control diet during the experiment but those in groups B and C were respectively given control diet supplemented with *Enterococcus faecium* and *Bifidobacterium* genera probiotics based on their instruction. Twenty chicks were bled from each group on days 21, and 42 of age. The sera were assayed for cholesterol and triglyceride levels using commercial biochemical kits. The results showed that in group A, the cholesterol and triglyceride amounts increased with no significant changes until 42 days of age. In groups B and C, these amounts had a non significant decline. At first and second bleeding, the cholesterol and triglyceride amounts of B and C groups were significantly lower than group A, but there was no difference between group B and C. It is concluded that inclusion of probiotics based on *Enterococcus faecium* and *Bifidobacterium* genera could decrease the cholesterol and triglyceride components of broiler chicks' sera.

Key Words: Probiotic, *Enterococcus faecium* and *Bifidobacterium* genera, Cholesterol, Triglyceride, Broiler chicks.

Introduction

Probiotics or direct-fed microbials are live microbial supplements that, when administered in adequate amounts, confer a beneficial effect on the health of the host by improving its intestinal microbial balance (FAO/WHO, 2001; Fuller, 1989). Among the numerous intestinal microbes, those that are expected to beneficially affect the host by improving the intestinal microbial balance, and hence are selected as probiotics, include species of the genera *Lactobacillus, Bifidobacterium*, and *Enterococcus* (Fuller, 1991; Gordin and Gorbach, 1992)

Cholesterol is essential for many functions in body because it acts as a precursor to certain hormones and vitamins and it is a component of cell membranes and nerve cells. It is known that elevated levels of total blood cholesterol or other blood lipids (such as triglycerides as the main components) are considered risk factors for developing of human coronary heart diseases (Lim *et al*., 2004). Although the extent of influence varies significantly from person to person, but the lipid component of diet is known to play a major role in serum cholesterol and triglyceride levels.

One of the main roles of probiotics bacteria is control of serum cholesterol and triglyceride levels (Lin *et al*. 1989; Taranto *et al*. 1998). There are some evidences proposing that *Lactobacillus* feed supplementation reduces the cholesterol and fatty acid composition of broiler chick's body (Kalavathy *et al*., 2006). The objective of the present study was to determine the effects of two commercially-available probiotics respectively based on *Enterococcus faecium* and *Bifidobacterium* genera on cholesterol and triglyceride levels of broiler chicks' sera.

Materials and Methods

Chickens and diets

A total of one hundred and fifty-six day-old broiler chicks (Ross 308) which consist of male sex were obtained from a commercial hatchery with a good reputation of producing diseases free chicks and randomly divided into 3 groups (A, B, and C) of 52 birds each. The birds in group A received control mash diet (based on corn and soybean) during the experiment, but those in groups B and C were fed diet supplemented with commercial probiotics based

on *Enterococcus faecium* and *Bifidobacterium* genera according to their instructions, respectively. Each dietary treatment had four replicate pens with 13 chicks per pen and the pens were randomized with respect to the dietary treatments. All chicks were reared under sanitary conditions and fed for 6 weeks on rations formulated to meet the nutrient requirements of broiler (National Research Council, 1994). Feed and water were provided *ad libitum*. All birds were vaccinated by eye instillation of B_1 vaccine (Merial, France) at 9 and 18 days of age.

Sampling procedure

On 21st and 42nd days of age, twenty chicks from each group were bled via brachial vein. After collecting blood from chicks, they were marked with leg bands, so that they were not reused for blood collection. The separated sera by centrifugation (1000 rpm, 5 min) were stored at -20°C until the end of the experiment.

Chemical analysis

The assessment of cholesterol and triglyceride levels of prepared sera was made by using commercially-available biochemical kits (Zistshimi, Iran). All sera were analyzed in duplicate.

Statistical analysis

The data were compared by analysis of variance (ANOVA) and Duncan multiple range test (Snedecor and Cochran, 1980) using SPSS version 11.5 for windows. The level of *p-value* <0.05 were considered as significant.

Results

The results of Table 1 show that in control chicks (group A), the cholesterol and triglyceride amounts increased without any significant changes ($p>0.05$) until 42 days of age. In group B and C, the cholesterol and triglyceride amounts had a non-significant decline with aging ($p>0.05$). At first and second bleeding, the cholesterol and triglyceride amounts of B and C groups were significantly lower than group A ($p<0.05$), whereas there was no difference ($p>0.05$) among group B and C.

Discussion

Nowadays, cardiovascular diseases are the main causes of death in most countries and it is strongly associated with hypercholesterolemia and hyperlipidemia (Lee *et al*., 1992). Because serum cholesterol and triglyceride levels are strongly associated to the lipid component of diet, so, decreasing the cholesterol and lipid composition of human food could be very important to decrease the rate of cardiovascular disorders.

In recent times, with the renewal of interest in the use of probiotics in broiler nutrition, development of more effective probiotic preparations, which comply with the various probiotic characteristics, has been found to improve the lipid component of blood serum and thus the lipid composition of carcass. Kalavathy *et al*. (2006) proposed that *Lactobacillus* probiotic supplementation can reduce the cholesterol in the carcass and liver and fat contents in the carcass, muscle and liver.

With due attention to the results obtained from the current study it is suggested that, like *Lactobacillus* probiotics, diet supplementation with *Enterococcus faecium* or *Bifidobacterium* genera probiotics could decrease the cholesterol and triglyceride components of serum. However, an overall judgment about their effects on lipid composition of carcass and in the sequel decreasing the chance of human cardiovascular disorders needs further study for evaluating the cholesterol and triglyceride levels of muscles and liver.

References

FAO/WHO (2001) Evaluation of health and nutritional properties of powder milk and live lactic acid bacteria. *Food and Agriculture Organization of the United Nations and World Health Organization Expert Consultation Report*, Cordoba, Argentina, pp. 1-34.

FULLER R. (1991) Probiotics in human medicine. *Gut* 32: 439-442.

FULLER, R.(1989)Probotics in man and animals.*The Journal of applied bacteriology*66:365-78

GORDIN, B.R. AND GORBACH, S.L. (1992) Probiotics for humans. In: Fuller R. (Eds) *Probiotics, the scientific basis*, pp. 355-376 (London, Chapman & Hall).

KALAVATHY, R., ABDULLAH, N., JALALUDIN, S., WONG, M.C.V.L. AND HO, Y.W. (2006) Effects of *Lactobacillus* feed supplementation on cholesterol, fat content and fatty acid composition of the liver, muscle and carcass of broiler chickens. *Animal Research* 55: 77-82.

LEE, Y.W., ROH, W.S. AND KIM, J.G. (1992) Benefits of fermented milk in rats fed by hypercholesterolemic diet (II). *Korean Journal of Food Hygiene* 7: 123-135.

LIM, H.J., KIM, S. AND LEE, W. (2004) Isolation of cholesterol-lowering lactic acid bacteria from human intestine for probiotic use. *Journal of veterinary science* 5: 391-395.

LIN, S.Y., AYRES, J.W., WINKLER, W. AND SANDINE, W.E. (1989) Lactobacillus effects on cholesterol: in vitro and *in vivo* results. *The Journal of dairy research* 72: 2885-2889.

NATIONAL RESEARCH COUNCIL (1994) Nutrient Requirements of Poultry. 9th. Ed., National Academy Press, Washington DC.

SNEDECOR, G.W. AND COCHRAN, W.G. (1980) Statistical Methods, 7th Ed., Iowa State University Press, Iowa.

TARANTO, M.P., MEDICI, M., PERDIGON, G., RUIZ HOLGADO, A.P. AND VALDEZ, G.F. (1998) Evidence for hypocholesterolemic effect of *Lactobacillus reuteri* in hypercholesterolemic mice. *Journal of dairy science* 81: 2336-2340.

Table 1.Effects of dietary probiotics (with different sources) on serum cholesterol and triglyceride amounts[1] (mg/100ml) in broiler chicks

	Cholesterol		Triglyceride	
Days of age	21	42	21	42
Diet				
No probitic s.[2] (A)[3]	169±0.47^{Aa}	175±0.13^{Aa}	172±0.33^{Aa}	186±0.51^{Aa}
Enterococcus faecium s. (B)	139±0.22^{Bb}	126±0.25^{Bb}	135±0.28^{Bb}	119±0.23^{Bb}
Bifidobacterium genera s. (C)	131±0.32^{Cb}	121±0.15^{Cb}	132±0.19^{Cb}	124±0.27^{Cb}

$^{A-C}$ For each factor, values in lines with no common capital alphabetic superscripts differ significantly (p<0.05).
$^{a-b}$ For each factor, values in columns followed by different lower-case superscripts are significantly different (p<0.05).
[1]Values represent means±SE for each treatment; n=20.
[2]Supplementation,
[3]() = group