WVJ
World's Veterinary Journal

World's Vet. J. 2(1): 11-12, 2012

Short Communication

The Oxidative Damages Caused by Bacterial Growth in Foodstuffs

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ABSTRACT

Obligate aerobes have respiratory metabolism with oxygen as the terminal electron acceptor. Therefore, they can produce ROS and oxidative damages in foodstuff which is contaminated. The egg yolks were incubated with different dilution of standard of *E.coli* and lipid peroxidation was assayed. The level of lipid peroxidation of high group (10^7) was 0.061±0.01 as compared with control; 0.016±0.003. We concluded that pathogenic *bacteria can induce oxidative damages plus other problems in food.*

Keywords: Bacteria, food, oxidative stress

INTRODUCTION

250 different food-borne diseases have been described that bacteria are the causative agents of two thirds of food-borne disease outbreaks. The pathogenesis of bacteria causing food-borne poisoning depends on their capacity to produce toxins (exotoxin or endotoxin) after ingestion, in the digestive tract or before, toxins preformed in foodstuff (Yves *et al.*, 2003). Meanwhile, they do produce reactive oxygen species (ROS) because of aerobic metabolism. Obligate aerobic bacteria have aerobic respiration and they use free oxygen as a final electron acceptor is known as obligate aerobes. $O_2^{\cdot -}$ and H_2O_2 are unavoidable by product of the aerobic respiration. H_2O_2 can produce $HO^{\cdot}$, a powerful oxidant that reacts with molecules, in Fenton reaction. ROS are generated in exponentially growing *E. coli* by the auto-oxidation of components of the respiratory chain (Storz and Imlay, 1999). ROS induce oxidative stress and damage to macromolecule such as DNA, lipids, proteins, carbohydrates and they cause mutation in genes in biological system and also have been attributed to arthrosclerosis, Parkinson's disease, Alzheimer's disease, cancer and aging.

In foods; ROS attack polyunsaturated fatty acids and cause lipid peroxidation. It is a major cause of quality deterioration in food (Coupland and McClements, 1996). Lipid peroxidation, known as rancidity, is one of known effects of ROS that is studied for first time in 1820 (Swern *et al.*, 1948). Lipid peroxidation changes type and concentration of molecular species in food (Mcclements and Decker, 2000).

In this study, oxidative damage of *E.coli* (ATCC25922) as aerobic bacteria in egg-yolks as foodstuff has been investigated.

MATERIALS AND METHODS

At first, a stock of egg-yolk was prepared. Standards of *E.coli* in different dilution (10^5,10^6 and10^7) were added to stock. The samples were incubated at 37C for 20h. After growth of bacteria, level of lipid peroxidation was evaluated. The formation of malondialdehyde (MDA) was measured according to the previous method (Sicinska *et al.*, 2006). Briefly, the samples solution mixed with 20% trichloroacetic acid. Samples were centrifuged. Thiobarbituric acid was added to the supernatant and the samples were heated. The absorbance of the supernatant was measured at 532 nm, lipid per-oxidation was expressed in absorbance units. The statistical analysis was carried out by one way analysis of variance (ANOVA). P values ≤ 0.05 were considered significant.

RESULTS AND DISCUSSION

The results of experiments are shown in Table 1. The level of lipid peroxidation was analyzed with respect to OD measured at wavelength with spectrophotometer. There was significant difference between high group of *E.coli* and control.

To cite this paper: Sadighara P. and Barin A. 2012. The Oxidative Damages Caused by Bacterial Growth in Foodstuffs. *World's Vet. J.* 2(1): 11-12.
Journal homepage: http://wvj.science-line.com/

Table 1. Level of lipid peroxidation.

***E. coli* (ATCC25922)**	
Total count	**Lipid peroxidation**
Control(0)	0.016±0.004
10^5	0.018±0.001
10^6	0.045±0.02
10^7	0.061±0.01

Each value represents the mean ±SD per group. The values were significant difference in 10^7 as compared with control ($P<0.05$).

Our results indicated that bacteria can produce higher MDA concentration and cause oxidative damage in high number in foodstuff. MDA is a product of lipid peroxidation that has been used as an indicator of oxidative stress. Consumption of MDA concentration foodstuffs has been associated with some problems. This component is highly reactive that can cause deterioration of biological molecules such as DNA (Lin and Yen, 1999), and it is mutagenic and tumorigenic (Zhang *et al.*, 2001). It affects the function of mitochondria. MDA cross links with valuable amino acid, which in consequences reduces the nutritive value of food (Halam *et al.*, 2003). Moreover, lipids are the major component of food. They can contribute in food flavor, aroma, color, shelf life and nutritional value. Lipid peroxidation is one of known effects of ROS in foodstuff, which containing fat such as meat, milk and egg products. Lipids are reservoir fat soluble vitamins and lipid peroxidation process damage to fat soluble vitamins.

In conclusion, in this study significant results were observed for high group (10^7) as compared to the control group and this survey elucidated the correlation between oxidative damage in food and growth bacteria.

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