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MODERN SCIENCE, PRACTICE, SOCIETY

25 MAY 26 XVIII SCIENTIFIC AND PRACTICAL CONFERENCE

BOSTON, USA

DOI 10.46299/ISG.2020.XVIII
ISBN 978-1-64871-446-7

MODERN SCIENCE, PRACTICE, SOCIETY

Abstracts of XVIII International Scientific and Practical Conference

Boston, USA
25-26 May 2020

Library of Congress Cataloging-in-Publication Data

UDC 01.1
The 18 th International scientific and practical conference « MODERN SCIENCE, PRACTICE, SOCIETY » (25-26 May 2020). Boston, USA 2020. 514 p.

ISBN - 978-1-64871-446-7

Published on Bookwire by Bowker
https://www.bookwire.com/

Collection of scientific articles published is the scientific and practical publication, which contains scientific articles of students, graduate students, Candidates and Doctors of Sciences, research workers and practitioners from Europe, Ukraine. The articles contain the study, reflecting the processes and changes in the structure of modern science. The collection of scientific articles is for students, postgraduate students, doctoral candidates, teachers, researchers, practitioners and people interested in the trends of modern science development.

The recommended citation for this publication is:
Aleksandrova N.,the role of managerial culture in the educator's professional growth // Impact of modernity on science and practice. Abstracts of XVIII International Scientific and Practical Conference. Boston, USA 2020. pp. 14-18 pp..

URL: http://isg-konf.com .

MARKERS OF OXIDATIVE STRESS IN THE BLOOD OF QUAILS UNDER THE INFLUENCE OF SELENIUM NANOPARTICLES

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Due to the action of various physicochemical factors on the body, there are changes in the functioning of the antioxidant defense system, which is able to activate oxidative stress, leading to damage to important biomolecules such as proteins, lipids and DNA, as well as disruption of energy processes in cells. The main targets of reactive oxygen species are proteins and lipids, which are part of cell membranes and cytoplasm. Indicators of oxidative modification of proteins, lipoperoxidation, and activity of enzymes of the antioxidant system are used as markers which characterize metabolic processes in the body and the use of biologically active drugs in livestock and poultry. Recently, there have been a number of reports on the effective and promising use of selenium nanoparticles (SeNPs) obtained by the method of "green" synthesis [1, 2]. The products obtained by this method are biosafe, because in the case of the manufacturing of such nanoparticles it does not use toxic reagents. The efficiency of using nanoparticles is due to their increased specific surface area, which allows to absorb per unit mass much more adsorbed substances. The large specific surface area increases the adsorption capacity and adsorption on the nanoparticles of contaminants with the facilitation of their transport into cells. Nanoparticles, due to their small size, easily penetrate the body through the respiratory, digestive systems, skin, overcome biobarriers (hepato-encephalic, histohematic, placental), bind to nucleic acids and proteins, are embedded in cell membranes, penetrate into organelles with change in their functions and show more pronounced biological activity due to the large surface area per unit mass.

The addition of nanoselen to quail feed increases the safety of poultry and their average daily gain [3]. Free Selenium, as an element, is not in itself used by animals and birds. Much of it in tissues is in the form of selenium-containing amino acids, such as selenomethionine and selenocysteine [4]. It is in this form, or in the form of residues of selenocysteine Selenium is contained in various selenoproteins, selenium-

containing enzymes, which are direct components of vital processes. Selenium is known to be part of glutathione peroxidase (GPx), which is a component of the body's natural internal defense against oxidative stress [5]. This enzyme is involved in protecting cells from the harmful effects of hydrogen peroxide (H_2O_2) and free radicals. Each glutathione peroxidase is capable of reducing potentially dangerous reactive oxygen species, in particular H_2O_2 and lipid hydroperoxides to non-toxic compounds (water and alcohol), which prevents the formation of new free radicals. Glutathione peroxidase also affects the integrity of cell and intracellular membranes.

Quails are an extremely interesting biological object. In the past, quails were eaten as game, kept as songbirds, and finally used as objects for quail fights. Quails are now bred in many parts of the world to produce highly nutritious eggs and meat. The quail is a wonderful biological object, in particular they became the first living beings to be born in weightlessness, in space (1960). Domesticated quails are characterized by high egg production (up to 300 or more eggs) and incomparably higher quality eggs. The body of a quail is a perfect and efficient factory for the production of highly nutritious egg mass. The average weight of quail eggs is 9.5–12 g, which is 7% of body weight, and in chickens it is 3.5%. The weight of all eggs laid by quail laying hens is 20-24 times greater than the laying hen itself, while in hens this figure is much lower – 1: 8–1: 10. Low live weight, egg production (300 and more), hatchability (85–95%), short incubation period (15–18 days) and puberty (35–45 days), resistance to various infectious diseases, and to conditions of high planting density , the possibility of placement in low multi-tiered cage batteries make quail an universal object for industrial and homestead farms, as well as for biological, medical and veterinary research [6].

The aim of the study was to study the effect on the body of feed probiotic additives, selenium nanoparticles, compared with the inorganic form of selenium and their complex on growth, feed conversion, biochemical parameters of blood and preservation of quails.

According to the scheme, a herd of 400 daily quails was used, from which 4 groups (four subgroups in each) were formed according to the principle of analogues: control and three experimental. The experiment lasted 35 days. Birds of 1st group (control) were fed the main diet (MD), experimental quails of the 2nd group were fed MD + 0.3 mg (SeNPs) / kg of feed, birds of 3rd group were fed MD + 0.3 mg (SeNPs) / kg of feed + Probiphylact. The conditions for keeping birds of all groups were the same.

Selenium nanoparticles (SeNPs) are considered as new forms of selenium supplementation with high biological activity and low toxicity. It is known that SeNPs exhibit biomimetic activity, in particular oxidase-like one. Since the main effects of selenium are realized with the participation of selenomethionine, selenocysteine and selenoproteins, which are not synthesized in the human body of animals and birds, this biotransformation is carried out by plants or bacteria.

As a result of the conducted researches it is established that the use of selenium nanoparticles in the blood of experimental birds increases the content of phospholipids against the background of reducing the content of cholesterol and non-esterified fatty acids (NEFA). The decrease in the content of NEFA indicates their

intensive use as an additional source of energy, and the biosynthesis of endogenous phospholipids. Since the main target in lipoperoxidation reactions is polyunsaturated fatty acids of membrane phospholipids, the increase in phospholipids and decrease in the proportion of NEFA can be associated with a decrease in free radical oxidation by biologically active drugs.

The decrease in the content of LPO products and oxidative modification of proteins is a direct indication of the decrease in the generation of reactive oxygen species and the normalization of the enzymatic and non-enzymatic units in the antioxidant defense system. Studies had shown that with a decrease in the concentration of LPO products in the blood of quails the fatty acid composition of membranes normalizes, which provide selective permeability and regulate intracellular metabolism.

Protection of cells from the destructive effects of LPO products, as well as maintaining the oxidative balance in animals provides a multicomponent system of antioxidant protection. Antioxidant enzymes, in particular superoxide dismutase, catalase and glutathione-dependent enzymes, are involved in the mechanism of regulation of free radical processes. Studies had shown that the activity of superoxide dismutase in the blood of quails after the addition of selenium nanoparticles tends to increase. At the same time, in the experimental groups of birds on the background of the use of nanoparticles there is a decrease in catalase activity. Such changes in enzyme activity can be explained by the phenomenon of cross-regulation for superoxide dismutase and catalase.

The increase in glutathione peroxidase activity mainly contributes to the reduction of organic hydroperoxides and by-products of lipid peroxidation and is aimed at preventing the intensification of lipoperoxidation.

It is possible that the increase in glutathione peroxidase activity is also due to the presence of an available pool of glutathione. This is consistent with the idea that long-term activation of GPO is possible only if a sufficiently high level of intracellular glutathione is maintained, which acts not only as a substrate for reactions but also as a factor necessary for constant recovery of selenium-containing groups oxidized in the process. glutathione peroxidase reaction.

Reactive forms of Oxygen cause destructive changes in protein molecules. As a result of the conducted researches in the blood of quails oxidative modification of proteins products were detected, which react with 2,4-dinitrophenylhydrazine, the formed dinitrophenylhydrazones belong to aldehyde and keto derivatives of neutral and basic character. With the introduction of selenium nanoparticles into the diet, the concentration of carbonyl compounds of the main character in the blood of the experimental groups of birds was almost 2 times lower than the compounds of the neutral nature.

The use of selenium nanoparticles affected the preservation of birds [7–9]. The increase in average daily gains can be explained by inhibition of oxidative modification of proteins and lipids that are part of cell membranes and, as a result, the preservation of their integrity and viability.

Therefore, the processes of free radical oxidation in the body of quail are characterized by a stable level of activity, which is necessary for the normal course of processes.

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