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MOST FREQUENT DEVIATIONS FROM THE PRINCIPLES OF PREVENTION AGAINST COCCIDIOSIS IN POULTRY

M. Kapetanov, I. Stojanov, M. Živkov-Baloš

Scientific Veterinary Institute Novi Sad, Rumenacki put 20, 21000 Novi Sad, Republic of Serbia
Corresponding author: milos@niv.ns.ac.rs
Invited paper

Abstract: The coccidiosis is the most remarkable widespread parasitic poultry disease. Due to its clinical or subclinical course which is even more significant, high economical losses are evident. The health and the economical implications of coccidiosis are emphasized in intensive poultry farming.
In this paper investigation was performed on the most frequent deviations in application of preventive means against the coccidiosis. The data were analyzed during the period from the year 2005 to 2010. In order to locate possible factors that could contribute to the decreased prophylactic effects of anticoccidials, the flocks of broiler chickens, laying hens and parents were clinically examined and critical steps in farming technology were evaluated in detail. The type of equipment and its performance, and the duration of empty resting period between flocks were noted as the predominant technical determinants. Also some oversights were found in the design of programs for the control of coccidiosis, including the previously used coccidiostats and their efficacy in chicken flocks, the availability of drugs on market and the important elements of epizootiology of the disease. By permanent hygiene practice on poultry farms the infectious pressure may decrease. Anticoccidial drugs are mostly applied and are considered very efficient. However, since coccidia can acquire resistance to antibiotics and residual coccidiostats in consumer meat are found occasionally, their prophylactic use may be limited. The immunoprophylaxis is the most promising method so far. The use of anticoccidial vaccines in poultry stimulates its own immunological capacities and moreover, it enables the production of safe food and products. In recent years there is an increasing interest for the immunoprophylaxis in our country. In our region, the vaccination against coccidiosis is performed in about 90% of parent flocks and in 10 to 20% of commercial layers. However, development of the immune response against coccidia is complex and immune suppression can occur by different factors such as stress inducing conditions, bacterial (salmonella) and viral (Reo, IBDV, MDV, CAV) infections, aflatoxicosis and other. The noted deviations in preventive measures applied to combat coccidiosis were clearly defined. The obligative

introduction of HACCP in intensive poultry production implicate planned solutions for the control of coccidiosis.

Key words: coccidiosis, chemoprophylaxis, hygiene, vaccination

Introduction

The coccidiosis is the most remarkable widespread parasitic poultry disease. It frequently occurs in young birds mostly in chickens, rarely in poults, goslings, ducklings, pheasants, pigeons and other avian species. The disease is caused by coccidia, intracellular parasites of the Eimeria genus. The life cycle of coccidia is in intestinine in all birds or in renal ducts in geese, and the different stage forms (merozoite and schizont) cause severe damage and desquamation of the mucous membrane which is responsible for the diarrhea and altered clinical health. The birds get infected after ingestion of sporulated oocysts that are very resistant in the environment and to most of the disinfectants, so they may retain infectivity for a long period.

The yearly costs of prophylaxis and therapy of over two billions euros globally *(Graat, 1998)* illustrate how significant the coccidiosis is. In the analysis of mortality causes conducted on one farm, the coccidiosis was represented in 7.77% of deaths *(Kapetanov, 1997)*.

Almost all individuals are exposed to coccidia, and the disease is transmitted by direct contact or indirectly through the equipment, accessories, dust, people, vermins, wild birds and insects *(Graat et al., 1998)*. The overcrowding, high temperature and relative air humidity, inadequate nutrition, concomitant infections and all agents that decrease the immunity influence to the outspread of the disease *(Petričević, 1996)*. Most frequently the disease occurs in spring and autumn, the rainy period of the year.

In presented investigation, the most frequent deviations in preventive means against coccidiosis were analyzed, including technology normative of farming and the flock management, prophylaxis with anticoccidial drugs or by immunization.

Materials and Methods

The relevant data were analyzed during the period from the year 2005 to 2010. In order to locate possible factors that could contribute to the decreased prophylactic effects of anticoccidials, the flocks of broiler chickens, laying hens and parents from farms located in South Backa and Srem regions, were clinically examined and critical steps in farming technology were evaluated in detail. The average overall yearly counts included 179000 of broiler and layer breeder

chickens from 17 flocks, 615000 commercial layer chickens from 18 flocks and 4222000 broilers from 78 flocks.

The prevention of coccidiosis was mostly achieved using anticoccidial drugs. During single, and occasionaly several production cycles, the switching (rotation) program or the one to three week periodical, shuttle program in the same production cycle were applied.

The protection of breeders with immunization was the subject of investigation, too.

According to clinical signs of coccidiosis and specific pathological findings, laboratory confirmation of the particular parasites was provided.

Results and Discussion

Management of technical and technological requirements and veterinary survaillance for the prevention of coccidiosis

The results of most frequent deviations from preventive measures and procedures against coccidiosis in poultry were summarized and presented in the following order: Technical and technological level of equipment on the farms, analysis of performance in poultry houses, empty resting period, influence of global warming, chemoprophylaxis and immunoprophylaxis.

Technical and technological level of equipment on the farms. The general remark stands for little or none attention in selecting the proper location, in old and recently built poultry farms. The houses are often located in depressed area or on land with poor natural drainage. The floors lack or have an old and overused termo- and hydro- isolation. In older and often in newly constructed houses the floor level is practicaly equal to the ground. There are no drainage canals to collect the excess of athmospheric rainfalls and higher level of underground water. In such conditions, with some imntermissions, lower layer of litter is wet almost during the whole year and is hard to nurish. Thorough analysis of poultry farms located in South Backa and Srem regions revealed that 90% of all poultry houses do not meet the technical and technological requirements needed for the contemporary industrial production. In the last five years, we observed the expansion of improvized houses adapted for fast and inexpensive fattening on „green“ areas, with steel construction covered with nylon matherial. Such houses, named „greenhouses“ with dirt floor, are being built mostly on small area neglecting the safe distance in between and have small cubage. To mantain and nurish the litter and to disinfect such houses properly between subsequent turns is almost impossible. It is well known how important for the outbreak of coccidiosis are the quality of house management and its surrounding, sanitation and disinfection procedures particularly after the clinical disease, keeping other animals away from farm premisses etc. *(Gray et al., 1998)*.

Analysis of performance in poultry houses. In numerous cases drinking and feeding system were set improperly because houses were previously used for other purpose. Also the required drinking and feeding space was insufficient. Large proportion of flock have occupied the drinkers wetting the litter.
In Vojvodina Province, drinking water is"hard" with high content of limestone. This causes great dysfunction of niple system, because of the limestone deposits in niple valve water leaks non-stop and the litter bellow the drinker lines get wet. There is a need to separate and clean the drinking system after the production cycle. The litter humidity can be minimized if drinkers are properly maintaned, their position (height) is adjusted according to the age of poultry and enough drinking space is provided in number and capacity. The renewal of litter and its unnerving are constant activity in poultry houses *(Tres, 1996)*.
High energy costs, including gass or hard fuells that are used for heating the house and providing optimal ambiental temperature to chickens, force farmers to disperse chickens to the whole floor area in the later age, leaving behind the overused, poor litter. Flock performance and economical effects in such circumstances are defeating. Transformation from extensive to industrial farming had influenced that coccidiosis became significant health and economical issue. Large population of poultry in small insufficient ambient and conglomeration of chickens are the main reason for fast spread out and outbreak of coccidiosis and high losses *(Vertommen, 1994)*.

Farmers that do not have their own water supllies are often faced with the oscilations in pressure of water in drinking system. When the pressure lowers the chickens may be left without the water for some time, and with the increase of pressure thirsty chickens rush to drinkers, spilling the water and often wetting the litter. Such examples are frequently seen on farms that share the water resource with abattoirs or other farms.

Providing the „empty resting period" on farm. In order to achieve faster fattening and higher number of flock turns per year in broiler production, as well the specific market request to provide higher final weight, the service period that is the empty resting period on farm is shortenned. The period for to clean, wash and disinfect the entire house, repair the equipment and the rest between two subsequent turns is insufficient and short, particularly to ensure protection from opportune pathogens like coccidial spores. The incidences of a disease to some degree depend on men. The frequency of the outbreak and the introduction of pathogens to the farm through visitors and employees are closely related to farmer's dedication, education and skills *(Great et al., 1994*; *Petričević et al., 2006)*.

Observations on the global warming impact on poultry farming. At the very beginning of the new century it is clear that we have stepped into the period of global warming. According to the Republic Hydrometeorological Report for period from year 2005 to 2010, in Serbia there was an increase in number of tropical and

rainy days with 150% more of rainfalls in compair to refferent period. Projected to farm level, ambiental temperature may vary between 33^0C at the beginning to less than 21^0C later, and the relative air humidity from 40 to 80 % or even more, which is emphasized during the last several years *(Kapetanov et al., 2011)*. This newborn situation calls for alert and introduction of the tunnel ventilation system and the cooling system (system with cold bedewing) are necessary in order to maintain the microclimate regardless of poultry species or its category. However, farmers are not skilled to operate with such systems still. During the visits to farms, the cooling system was turned on in spite of the registered relative air humidity of more than 80%. In such circumstances the effect was adverse because the temperature could not decrease while at the same time the litter became a soppy useless mass. The relative humidity and the temperature are two most important prerequisite for exogenous development of coccidia.

Chemoprophylaxis. The use of anticoccidial drugs, predominantly in complete diets and rarely in water, is the most frequent mean of prevention in our poultry industry *(Mothis et al., 2004)*. According to the principle action, there are two groups of drugs: coccidiostats which only stop or inhibit the intracellular growth of coccidia, and coccidiocides that destroy coccidia in one of its stages. There is some confusion in relation to these terms. Most anticoccidials act as coccidiocidal drugs or at first they act coccidiostatic and then express coccidiocidal effect *(Petričević et al., 2006)*.

During the last several years many deviations were observed on field considering the very concept of chemoprophylaxis. In general, there were expert, technical and economical deviations.

The expert services in poultry industry are not used to monitor flocks that suffer from the clinical coccidiosis or to perform sections or even to send tissue samples or feces for laboratory examinations on regular bases. These procedures would be beneficial not only for to note the outbreak, but also to gain considerable information on the course, pathological lesions, the number of oocysts and the severity of infection.

The basis of rational therapy of coccidiosis are fast and precise diagnose and forehand adequate anticoccidial drug. The first rule is to apply forced dose of the drug selected. On the first day of therapy double dose should be applied by that increasing the successfull outcome. Further on, the dose recomended by prescription should be given until the end of therapy. The duration of anticoccidial therapy is in general two more days after clinical signs wane. When sulphonamides are used, the overall duration of therapy is seven days with three day intermission. Continuos five day therapy with sulphonamides is rarely applied. In case the signs of recovery are absent at latest after three days, it is recommended to stop the ongoing therapy and start another one with anticoccidial drug from different pharmacological group *(Williams, 1994; Petričević and Kaluđerović, 2000).*

Due to financial limits, anticoccidial therapy starts in later stage of the disease leaving thiny space to comprehensively estimate how severe is the condition and which drug should be chosen, that is frequently seen in case of mixed infections.

Coccidia can cause vast destruction of intestinal mucosae and creates favourable conditions for its colonization and propagation with different microorganisms like clostridia thus complicating the condition of the host. The use of antibiotics to prevent the possible complications is not common in therapy of coccidiosis, but in some circumstances it may be included, as well as preparations of vitamine A, K and C that have effect positive against the haemorrhage and speed up the vascularization *(Allen et al., 1998; Coombs and Muller, 2002)*.

The knowledge of chemoprophylaxis and its efficacy is needed to design the optimal control program against coccidiosis and to restrain the resistance of coccidia to anticoccidial drugs.

Besides the proper use i.e. dosage, strategic combat with tolerance to anticoccidials also reffers to substitution of drug used, after one rarely more turns applying „switching“ i.e. „rotation“ programs, or in a single turn by „shuttle“ program with one to three week intermission. The right choise of anticoccidial is the milestone of the control strategy, and all drugs may be included into the program. Many factors are important when designing the optimal control program: previously used medication, evaluation of empiric and/or objective success in the past turns, availability of drugs on market, their advantages and deficiencies, epizootiological data, and sensitivity of coccidia to particular drugs and the loss of sensitivity *(Braem and Suls, 1992; Dimitrijević and Ilić, 2004)*.

The expert technical deviations in chemoprophylaxis of coccidiosis were mostly noted in relation to its dose-dependent toxicity, duration of therapy and contraindications of some drugs in certain avian species. Simultaneous medication with for example ionophore antibiotics and thiamulin, monensin and sulphonamides or erythromycin, potentiate its toxicity even in therapeutic dose *(Petričević, 1998)*.

Immunoprophylaxis. The control of coccidiosis by immunization is the main practical alternative to chemotherapy. In recent years there is an increasing interest for the immunoprophylaxis in our country, because of residual anticoccidial drug content in meat and development of resistance against these drugs. The story of immunization against coccidiosis begins with *Johnson (1927)* and his results on the development of specific immunity to coccidia during infection. It is demonstrated that cellular immune response is predominant for host protection *(Shirley et al., 1995; Petričević 1998; Ilić et al., 2003; Lilić et al., 2009)*, although circulating antibodies that occur during infection are also important *(Crane, 1998)*. In our country the introduction of poultry vaccines against coccidiosis is described by *Orlić et al. (1995)*.

Live atenuatted vaccines are widely used. Vaccination is mostly restricted to breeder chickens and commercial layers, while broiler flocks are vaccinated only in prolonged fattening turns.
In our farming conditions it is essential to comply with the listed recomendations and precautions:
- vaccinate chickens during the first week of life. It takes at least one coccidial reproduction cycle to develop immunity, however for solid immunity reinfection with vaccinal strain of coccidia is needed and at least one additional reproduction cycle („recycle“);
- do not transfer chickens to another house or expand their living space in period of vaccination i.e. before „recycle“ is done;
- apply zoosanitary procedures consistantly in order to minimize the risk of infection with „wild“ field strains of coccidia or vaccination is useless;
- until solid immunity is developed medication using anticoccidials is not allowed. This is hard to accomplish in practice because most livestock feed mills are not technically equipped to provide continuous separate lines for diets with and without coccidiostats;
- prevent the activity of immunosupressive factors as much as possible during the raising period. Stressfull procedures, infections with bacteria (salmonellae) and viruses (Reo, MDV, IBDV,CAV) aflatoxicosis and other biological and chemical agents act depressive to immune response after vaccination *(Chleifer, 1994)*.

During the year 2010, we observed immunity „breakout“ in three broiler breeder and one layer breeder flocks, and in the year 2011one such case in layer breeder flock. The flocks were vaccinated with commercial vaccines from two producers that differ in number of coccidial species in the composition. The clinical findings and laboratory results are documented and archived in Veterinary Institute Novi Sad. The circumstances and causes that led to these unfortunate events are still subject of discussion.

Conclusion

In the paper the complex prevention of coccidiosis is emphasized. The knowledge of technical and technological normatives and the performance of poultry houses supported with the optimal resting period may guarantee successfull chemoprophylaxis and immunoprophylaxis in raising flocks.
General deviations noted in chemoprophylaxis were of expert, technical and economical kind.

In our farming conditions consistent zoosanitary measures and precautions should be pointed out in order to avoid detrimental consequences on health and performance of our poultry.

Najčešća odstupanja u primeni preventivnim mera protiv kokcidioze živine

M. Kapetanov, I. Stojanov, M. Živkov-Balož

Rezime

Kokcidioza je najznačajnije parazitsko oboljenje živine raširenо u celom svetu. Često prouzrokuje značajne ekonomske štete, bilo da je ispoljena u kliničkom ili subkliničkom obliku. Ovaj zdravstveni i ekonomski problem je naročito prisutan u intenzivnoj živinarskoj proizvodnji.

U istraživanjima sagledana su najčešća odstupanja od principa preventivnih mera protiv kokcidioze sa ciljem usavršavanja tehnologije gajenja i uvođenje doslednije hemoprofilakse i imunoprofilakse pilića. Istraživanjima je obuhvaćen period od 2005. do 2010. godine, u cilju utvrđivanja faktora koji utiču na smanjenje efikasnosti profilakse. Odstupanja su praćena kod brojlerskih jata, pilića komercijalnih nosilja i odgoja roditeljskih jata lakog i teškog genotipa, kliničkim pregledom i detaljnom procenom kritičnih tački u tehnologiji tova i odgoja jata.

Najčešća tehnička odstupanja su bila u pogledu tehničke opremljenosti i funkcinalnosti u proizvodnim objektima, poštovanje servis perioda. Utvrđeni su propusti u dizajniranju optimalnog programa kontrole kokcidioze u vezi sa prethodnom upotrebom određenih antikokcidijalnih lekova, prethodno postignutim rezultatima, izborom određenih lekova na tržištu, njihovim prednostima i nedostacima i epizootologiji kokcidioze. Imunoprofilksa je za sada preventivna metoda koja najviše obećava.

Pokrivenost imunoprofilaksom u odgojnim roditeljskim jatima lakog i teškog genotipa u poslednjih godina je porasla na 90%, dok kod pilića komercijalnih nosilja iznosi od 10 do 20%. Pojava stresa pilića, infekcije salmonelama, reo virusima, alfatoksikoza, zarazna bolest burze, Marekova bolest, zarazna anemija pilića, kao i drugi biološki i hemijski agensi imaju negativan imunološki odgovor s obzirom na imunosupresiju.

U posmatranom periodu odstupanja od principa preventivnih mera kod kokcidioze pilića su jasno definisana gde se sa obaveznim uvođenjem HACCP sistema u organizovanoj živinarskoj proizvodnji pristupa planskim rešenjima.

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