

УДК 619.616.993.192

DOI: 10.31016/1998-8435-2021-15-2-95-100

Original article

## The influence of coccidiostatic Baycox on the course of coccidiosis in broiler chicken

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Received on: 05.11.2020; accepted for printing on: 12.01.2021

### Abstract

**The purpose of the research** is to identify species of *Eimeria* spp. in chicken broilers suspected to be infected with coccidia and to determine the effect of coccidiostatics in the course of coccidiosis.

**Materials and methods.** The study involved 20 six-week-old broiler chickens obtained from a farm heavily affected by coccidia (natural infection – a high oocyst incidence). Each group yielded 10 randomly picked chickens to be used in the experiment. The birds were divided into 2 groups 10 chickens each: control (I); Baycox-treated (II); Baycox was applied for 2 days in a concentration of 25 ppm in drinking water. Samples of broiler chickens' droppings were tested qualitatively by the flotation method (Willis-Schlaaf) and then quantitatively by the McMaster technique. The chickens were killed 6 days post-treatment and their intestinal mean total lesion scores (MTLS) were graded 0 to 4 on an arbitrary scale described by Johnson and Reid (1970).

**Results and discussion.** As a result of the research, six species of protozoa of the genus *Eimeria* were identified: *E. acervulina*, *E. tenella*, *E. brunetti*, *E. maxima*, *E. mivati*, *E. necatrix*, while *E. necatrix* and *E. maxima* were the dominant species. This proves the presence of such species as *E. mivati*, *E. acervulina* (76.34%) in the anterior segment of the intestine and *E. necatrix*, *E. maxima* (83.34%) – in the middle segment of the small intestine. Infections of *E. brunetti* broilers amounted to 51.11%. The most pathogenic species of *E. tenella* residing in the cecum was found in 37.53%. MTLS in the group of chickens that received Baycox was 0.33. The post-treatment oocyst indices in the second group amounted to 1 (1–50 oocysts in 1 g of faeces), in the control group MTLS was very high (2,5), the oocyst index exceeding 3.

**Keywords:** coccidiosis, chickens, control, prophylaxis, prevalence

**Financial Disclosure:** none of the authors has financial interest in the submitted materials or methods.

**There is no conflict of interests**

**For citation:** Balicka-Ramisz A., Laurans Ł., Batko M., Ramisz A. The influence of coccidiostatic Baycox on the course of coccidiosis in broiler chicken. *Rossiyskiy parazitologicheskij zhurnal = Russian Journal of Parasitology*. 2021; 15 (2): 95–100.

<https://doi.org/10.31016/1998-8435-2021-15-2-95-100>

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Оригинальная статья

## Влияние кокцидиостатика байкокса на течение кокцидиоза у цыплят-бройлеров

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Поступила в редакцию: 05.11.2020; принята в печать: 12.01.2021

### Аннотация

**Цель исследований:** идентификация обнаруженных у цыплят-бройлеров кокцидий *Eimeria* spp. и оценка эффективности байкокса против кокцидий.

**Материалы и методы.** Исследовано 20 цыплят-бройлеров в возрасте 6 недель с фермы, неблагополучной по кокцидиозу. Цыплят разделили на две равные группы. Первая группа цыплят была контрольной и им препарат не давали. Цыплятам второй группы задавали байкоккс в течение 2 сут в концентрации 25 ч/млн вместе с водой. Пробы помета цыплят-бройлеров исследовали качественно методом флотации (Willis-Schlaaf), а затем количественно методом МакМастера. Цыплят умерщвляли через 6 сут после обработки, и их средние показатели общего поражения кишечника оценивали от 0 до 4 баллов по произвольной шкале, описанной Johnson and Reid (1970).

**Результаты и обсуждение.** По результатам исследований выявлено шесть видов простейших рода *Eimeria*: *E. acervulina*, *E. tenella*, *E. brunetti*, *E. maxima*, *E. mivati*, *E. necatrix*, при этом виды *E. necatrix* и *E. maxima* были доминирующими. Виды *E. mivati*, *E. acervulina* (76,34%) локализовались в переднем сегменте кишечника, *E. necatrix*, *E. maxima* (83,34%) – в среднем сегменте тонкой кишки. *E. brunetti* обнаружены у 51,11% исследованных цыплят. Наиболее патогенный вид, *E. tenella*, паразитирующий в слепой кишке, обнаружен у 37,53% особей. Средний показатель общего поражения кишечника в группе цыплят, получавшей байкоккс, составил 0,33. Уровень загрязненности фекалий ооцистами после обработки во второй группе составил 1 (от 1 до 50 ооцист в 1 г фекалий), в контрольной группе – превышал 3, а средний показатель общего поражения кишечника – 2,5.

**Ключевые слова:** кокцидиоз, куры, борьба, профилактика, распространение

**Прозрачность финансовой деятельности:** никто из авторов не имеет финансовой заинтересованности в представленных материалах или методах.

**Конфликт интересов отсутствует**

**Для цитирования:** Балицка-Рашиш А., Лауранс Э., Батко М., Рашиш А. Влияние кокцидиостатика байкоккса на течение кокцидиоза у цыплят-бройлеров // Российский паразитологический журнал. 2021. Т. 15. № 2. С. 95–100. (In Eng.).

<https://doi.org/10.31016/1998-8435-2021-15-2-95-100>

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### Introduction

As an environmental disease, coccidiosis continues to be a significant health problem in poultry production. According to prof. Jeffers, it is the most common disease in poultry [9]. The course of the infection of this dangerous disease is the result of many environmental factors. The outbreak of the disease may contribute to frustrating the breeder's effort by direct losses

(chicken sickness and falls) as well as indirect losses manifested by worse production effects.

Seven coccidial species have been described in chickens, of which five – *Eimeria tenella*, *E. necatrix*, *E. brunetti*, *E. acervulina* and *E. maxima* – are considered pathogenic species. The pathogenicity of *E. mitis* and *E. praecox* is ambiguous – by many researchers they are classified as non-pathogenic [5, 14], however, more and more data indicate the

impact of these species on the profitability of production, as infection, despite the absence of disease symptoms and falls, leads to a deterioration of the economic results of breeding [5, 11].

The problem of coccidiosis prevention in Poland is generally not covered by any coordination. Dispersion of feed and premix producers, the declining profitability of this industry and extremely fierce competition do not encourage activities on the coordination of activities in the field of rationalization of coccidiosis chemoprophylaxis programs. The current policy, or rather the lack of a policy regarding the use of coccidiostats in poultry production, leads to losses caused by these parasites, and they result directly from lower economic effects [3].

The aim of the present research was to identify species of *Eimeria* spp. in chicken broilers suspected to be infected with coccidia and to determine the effect of coccidiostats in the course of coccidiosis.

### Materials and methods

**Animals.** The study involved 20 six-week-old broiler chickens obtained from a farm heavily affected by coccidia (natural infection – a high oocyst incidence). The chickens were kept in an electrically heated poultry house and fed ad libitum with appropriate feed and water. The basic

diet contained 18% total protein, 8% fat, 4% crude fibre, 0.4% methionine, 0.3% cysteine, 18% tryptofan, 0.9% lysine, 1% calcium, and 0.5% phosphorus. Each group yielded 10 randomly picked chickens to be used in the experiment. The birds were divided into 2 groups 10 chickens each: control (I); Baycox-treated (II); Baycox was applied for 2 days in a concentration of 25 ppm in drinking water.

Parasitological analysis. More specifically, fecal samples were qualitatively analyzed by using the Willis-Schlaaf flotation with saturated NaCl solution and a McMaster method with a detection level of *Eimeria* spp. oocysts per gram of feces was performed with saturated NaCl solution [4]. The procedures of propagation and harvesting of oocysts, and preparation of oocysts followed by recommendations Eckert [4]. The chickens were killed 6 days post-treatment and their intestinal mean total lesion scores (MTLS) were graded 0 to 4 on an arbitrary scale described by Johnson and Reid (1970) (Fig.1) [10].

### Results and discussion

As a result of the research, six species of protozoa of the genus *Eimeria* were identified: *E. acervulina*, *E. tenella*, *E. brunetti*, *E. maxima*, *E. mivati*, *E. necatrix*, while *E. necatrix* and *E. maxima* were the dominant species (table 1).

Table 1

The infection rate of coccidia species in broiler chickens

| Coccidia species                        | Partition of intestine according to Johnson-Reid | Infection rate, % |
|-----------------------------------------|--------------------------------------------------|-------------------|
| <i>E. mivati</i> , <i>E. acervulina</i> | 1                                                | 76,34             |
| <i>E. necatrix</i> , <i>E. maxima</i>   | 2                                                | 83,34             |
| <i>E. brunetti</i>                      | 3                                                | 51,11             |
| <i>E. tenella</i>                       | 4                                                | 37,53             |

In the digestive tract of chicken broilers, anatomical changes were particularly frequent in the anterior and middle sections of the small intestine. This proves the presence of such species as *E. mivati*, *E. acervulina* (76.34%) located in the anterior segment of the intestine and *E. necatrix*, *E. maxima* (83.34%) located in the middle segment of the small intestine. Infections of *E. brunetti* broilers amounted to 51.11%.

This specie is localized in the rectum and the steak. The most pathogenic species of *E. tenella* residing in the cecum was found in 37.53% (Table 1).

The analysis of the obtained results showed that in most cases broilers were affected by mixed infections with the predominance of five and six species. They were confirmed in 66.4% of the tested chickens.

In half of the farms studied, dangerously high degree of infection with chickens coccidia was demonstrated.

Baycox is a well-known coccidiostatic particularly useful for controlling poultry coccidiosis. MTLS in the Baycox-treated group was 0.33. The post-treatment oocyst indices in these groups

amounted to 1 (1-50 oocysts in 1 g of faeces). The control group MTLs was very high (2,5), the oocyst index exceeding 3 (more than 300 oocysts in 1 g of faeces) (Table 2, 3).

lands, Iran, Korea, Norway, Romania and Turkey show that the most common species of coccidia, similarly to our country, were *E. acervulina* and *E. tenella* [6, 8, 12, 13, 15]. The research was con-

ducted in Russia. The work was carried out in a laboratory for infection diseases of farm animals and poultry of the Caspian Zonal Scientific Research Veterinary Institute, and in the Republic poultry farms. The results of broiler chickens' cecum examinations revealed a high rate of *Eimeria* infection. Thus, 20–30 oocysts were found in 55 samples in a single microscope field representing 63.2%. The oocysts referred to four species: *E. tenella*, *E. maxima* and *E. mitis* in the cecum and small bowel, and *E. accervulina* in the duodenum. 100% efficacy of Eimertem 2.5% and Enrofloxacin when combined with water was confirmed. The mortality rate reduced from 137 to 11 animals per day. The survivability of broiler chickens in the test group in the growing period was 94.3% [1].

Coccidiosis is a serious problem in broiler chicken production in Poland. Coccidiostats are used to combat this disease. In last time additionally for coccidiosis control compounds are applied, which stimulated the non-specific resistance system.

Table 2

#### Broiler coccidiosis: control group

| Chicken No. | Lesion score of intestinal sections |     |     |     | Oocyst index |
|-------------|-------------------------------------|-----|-----|-----|--------------|
|             | 1                                   | 2   | 3   | 4   |              |
| 1           | 2.0                                 | 3   | 2   | 3   | 3            |
| 2           | 2.5                                 | 3   | 2   | 2.5 | 3            |
| 3           | 2                                   | 2.5 | 1   | 1.5 | 2            |
| 4           | 1.5                                 | 2   | 3   | 1.5 | 2            |
| 5           | 3.5                                 | 2.5 | 2.5 | 2   | 3            |
| 6           | 3                                   | 2   | 1.5 | 1.5 | 2            |
| 7           | 4                                   | 3.5 | 3   | 1   | 3            |
| 8           | 1.5                                 | 2   | 3   | 2.5 | 1            |
| 9           | 3.5                                 | 3   | 2.5 | 2.5 | 3            |
| 10          | 3                                   | 2.5 | 2.5 | 1.5 | 2            |

MTLS = 2.5

Table 3

#### Prevalence of coccidia in broilers after Baycox treatment

| Chicken No. | Lesion score of intestinal sections |     |   |   | Oocyst index |
|-------------|-------------------------------------|-----|---|---|--------------|
|             | 1                                   | 2   | 3 | 4 |              |
| 1           | 0                                   | 0   | 0 | 0 | 0            |
| 2           | 1                                   | 0.5 | 0 | 0 | 1            |
| 3           | 0                                   | 1   | 2 | 0 | 1            |
| 4           | 0                                   | 0   | 0 | 0 | 0            |
| 5           | 0.5                                 | 0   | 0 | 0 | 0            |
| 6           | 1.5                                 | 0   | 0 | 0 | 0            |
| 7           | 1                                   | 1   | 1 | 1 | 1            |
| 8           | 0                                   | 1   | 0 | 0 | 0            |
| 9           | 0                                   | 1   | 0 | 0 | 0            |
| 10          |                                     | 0   | 0 | 0 | 0            |

MTLS = 0.33

Coccidiosis remains one of the major threats for poultry industry throughout the world [7]. The disease is traditionally controlled by the use of chemoprophylactic measures including anti-coccidials in feed that inhibit the developmental stages of *Eimeria*.

The dominance of individual species of coccidia is variable and depends not only on the area, but may also change over time in the same area. From scientific reports from various countries, incl. The Czech Republic, France, the Nether-

In Poland the most frequently diagnosed species were *E. tenella* (64%), *E. acervulina* (32%), *E. maxima* (8%), and *E. necatrix* (4%). Most cases were caused by a single species of coccidia (92%), and in 8% of cases two species of coccidia were found [5]. On the other hand, studies by Doner and Szeleszczuk showed that in the country broiler chickens were infected with several species (*E. acervulina*, *E. mitis* and *E. maxima*), and infections with *E. tenella* constituted 29% [2, 3].

Table 4

Summary of the intestinal lesion scores of the experimental groups

| Group   | MTLS in chicken intestine * |     |     |     | Average<br>MTLS from 10 chickens | Oocyst index |
|---------|-----------------------------|-----|-----|-----|----------------------------------|--------------|
|         | 1                           | 2   | 3   | 4   |                                  |              |
| Control | 2.6                         | 2.6 | 2.2 | 1.9 | 2.3                              | 3            |
| Baycox  | 0.6                         | 0.4 | 0.2 | 0.1 | 0.31                             | 0.2          |

\* – Each entry in the table is an average of data for 10 chickens

## Conclusion

Despite the introduction of new diagnostic techniques into coccidiosis research, the disease remains a problem in the poultry industry. In Poland, there is no nationwide program of prevention, based on the use of coccidiostats and vaccines against coccidiosis.

Explanation: 1, 2, 3, 4, intestinal sections identical to those in Fig. 1.

Mean Total Lesion Score (MTLS) range: 0-4

Oocyst index: 0

1 = 1 – 50 oocysts in 1 g faeces

2 = 51 – 300 oocysts in 1 g faeces

3 = > 300 oocysts in 1 g faeces

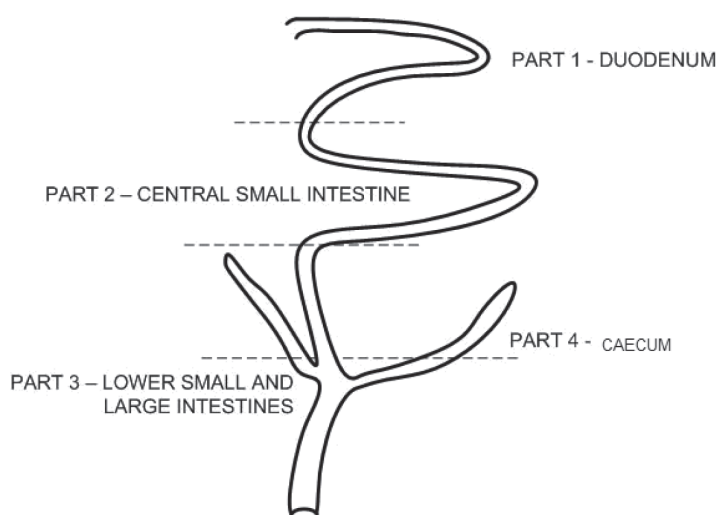


Fig. 1. Sections of broiler chicken intestine evaluated for MTLS [10]

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