

SWOLLEN HEAD SYNDROME IN HENS AND ITS CONTROL WITH THE USE OF ASCOGEN^R

SINDROM OTEČENE GLAVE U KOKOŠI I NJEGOVO SUZBIJANJE PRIMJENOM PROBIOTIKUMA ASCOGEN^R

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ABSTRACT

The paper describes the phenomenon of swollen head syndrome in broiler breeders. Clinical picture of disease and pathological macroscopic changes were similar to those reported by other authors. Within only 18 days of disease duration the mortality rate in laying hens amounted to 20.2%, 3.89% in cocks respectively, or in total to 18.41% in the entire flock. One part of the flock was given in feed 500 ppm of Ascogen^R (Chemoforma AG, Augst, Switzerland) for 6 months, and its use led to a significant remission of clinical signs of the disease. In the test group of layers given Ascogen^R the mortality rate in hens was reduced by 1,26%, in cocks by 1,98% egg yield was improved by 1,30% and hatching rate by 1.54%. Feed consumption per egg produced was reduced by 5.04% when compared to the control group. Invested means yield 8.16 times higher production value. The description of the swollen head syndrome in chicken is the first in Croatia.

Key words: swollen head syndrome, hen, probiotic Ascogen^R

INTRODUCTION

According to the reports of numerous authors swollen head syndrome (SHS) is a conditional infection of hens and turkeys (Heller et al., 1984; O'Brien, 1985; Wyeth et al., 1987; Gough et al., 1988). The main etiological cause of disease is a pneumovirus (Hafez, 1987; Picault et al., 1987; Jones et al., 1987; Cavanagh and Beret, 1988) in combination with several microorganisms and adverse ambient effects (Picault et al., 1987). A detailed description of this disease in turkey, named transmissible rhinotracheitis of turkeys (TRT) was given by Biđin et al. (1990), together with the first objective evidence of this infection recorded in Croatia. In addition to positive clinical findings of rhinotracheitis, the disease was also confirmed by the results of blood serum tests. In Croatia and Slovenia the disease has been recorded on several occasions (Mazija, 1988., unpublished observation) in broilers and broiler breeders.

Ascogen^R (synonym: Probioticum S) is composed of RNA and biologically active complex nucleotides. Naturally formed bases of pyrimidine and purine represent the main active principle. It is enriched with the acid metabolites of aspartate and citric metabolic cycle. Thermolyzed brewer's yeast acts as a carrier of the active complex. Nutrigen^R (synonym: Probioticum N) (Chemoforma LTD, Augst, Switzerland) has an almost identical composition as Ascogen^R. The only difference is in the ratio of ingredients. Both have been declared as a health promoting agents, and as such improve the production results, both in fattening and breeding animals.

The activity of Ascogen^R is mostly aimed at the stimulation of immune system, as confirmed by studies

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performed in mice (Anon, 1989). The lymphocyte count in the spleen detected in poultry after 6 weeks of use of Ascogen^R is almost 40% higher compared to the control group. Ramadan et al., (1989) have added 500 ppm of Ascogen^R to feed given to broilers either after or both before and after vaccination against Newcastle disease. In both test groups the titer of serum hem inhibition antibodies was by 1 log₂ higher than in the control group. After challenge infection the survival rate was increased by 20%.

Kos and Wittner (1982) have used Nutrigen^R in broilers and have obtained a significantly higher muscle weight gain when compared to control broilers of identical body weight. The use of Nutrigen^R showed at slaughter an improvement of 1.15% in male, 1.87% respectively in female broilers, i.e. of 1.47% on an average. Kos and Wittner (1982 a) have also investigated the effect of Nutrigen^R on the growth, feed conversion rate and performance in broilers given a feed quality with reduced protein content. Final weights at 48 days of age were higher by 20 g in male and by 60 g in female broilers compared to the control group. Protein utilization from feed containing 10-15% less methionine than required, was improved by 1.58%, 1.26% in female broilers respectively, or by 1.42% on an average. Mazija (1984., unpublished data) has used Nutrigen^R in broilers and has obtained the following results: final weight of broilers was improved by 2.9%, feed conversion by 5.3% and the weight at slaughter was increased by 3.5%.

Nutrigen^R has been found to be very effective in the reduction of both mortality rate and body fats in fattening piglets, as well as in the increase of ham and back diameter (Maier and Laciga, 1984).

As so far known, Ascogen^R does not produce adverse reactions. Determination of LD₅₀ in rat (Fuchs and Šoštarić, 1989) showed that an oral dose of 2000 mg of Ascogen^R per kilo bw. does not exert adverse effects. Ascogen^R and Nutrigen^R can be used combined with other drugs and different preparations which do not inhibit their activity. Satisfactory results are obtained after approx. 6 weeks of use. This paper gives both the description of disease and the results of use of Ascogen^R (Chemoforma LTD, Augst, Switzerland) in the control of clinical signs of disease.

MATERIALS AND METHODS

Clinical description of SHS

The opportunity to investigate the efficacy of Ascogen^R in the control of SHS has shown after the emergence of this disease in a flock of broiler breeders, Arbor

Acres (AA) hybrids. The farm on which Ascogen^R was used consist of 7 poultry laying houses, technically well-equipped, and it occupied an area of 1044 sq.m. A deep litter management was utilized and the feeding system was adequately arranged. Each poultry laying house had four chore Time feeding lines with in total 336 feeders. Laying pullets were reared on another farm till 18 weeks of age and then transferred to the production farm. The stock density amounted to 5.26 pullets and 0.67 cockerels per square meter and the required population was achieved by exclusion of less valuable pullets immediately prior to sexual maturity.

The program of specific immunoprophylaxis applied in the flock included the vaccination against Marek's disease, infectious bronchitis, avian encephalomyelitis, fowl pox and Newcastle disease. Besides, hens were also vaccinated against mycoplasmosis (*M. gallisepticum*). All vaccines were administered before sexual maturity. The results of laboratory test showed that the immunity against Newcastle disease was very poor, in spite of vaccination performed on four occasions.

In January 1989 the brooding farm was inhabited with day-old parent chickens (38.895 pullet chicks and 4.884 cockerel chicks) from three hatching in intervals of 5 to 7 days. During 18 weeks of growth the mortality rate amounted to 2.90% and 1.28% of birds were additionally excluded, so that 95.82% of total number of day-old chickens were transferred to the production farm. The main cause of deaths and exclusion from further production was staphylococcosis (77.0%).

This disease was treated on several occasions with streptomycin and gentamycin administered in drinking water with simultaneous use of vitamin preparations (BCK-Sel and AD3E), but without any satisfactory response. Pullets started lay eggs at the of 25 weeks.

The disease, which from both clinical and pathomorphological aspects, corresponded to swollen head syndrome, was observed in the flock immediately after the start of egg production. First, it was observed in layers in one poultry laying house and two days later in others. Within the next 13 days the disease spread all over the farm and affected approx. 25-30% of birds, regardless of sex.

This paper is not giving a detailed description of either clinical picture or macroscopic pathomorphological findings, as they basically did not differ from those described in literature (Perelman et al., 1988). The manifestation of disease included swollen head, face and area around eyes, in addition to a mild depression. After 72 hours 15-30% of hens and a smaller percentage of cocks showed a markedly expressed swelling of the head with torticollis, uncontrolled head movements and

Table 1. Dead and sacrificed birds affected with swollen head syndrome (number and percentage)
Tablica 1. Mrtvi i žrtvovani pilići zahvaćeni sindromom otečene glave (broj i postotak)

Number of birds Broj pilića	Laying house marking Oznake nastambi							Total Ukupno
	I	II	III	IV	V	VI	VII	
point of lay Dead or sacrificed mrtvi ili žrtvovani	5777	5994	5994	6178	6125	6150	6060	42278
layers nesilice	475	1211	937	1456	1177	1053	1288	7597
cocks pijetlovi	15	75	23	22	19	19	12	185
Total Number % Ukupno broj %	490 8.48	1286 21.45	960 16.02	1478 23.92	1196 19.53	1072 17.43	1300 21.45	7782 18.41

severe depression. Daily mortality rate ranged between 0.8% and 1.0% and in the course of disease duration it amounted to 20,27%. Dissection findings revealed the presence of conjunctivitis, edema of the head and neck and egg yolk peritonitis. Serological tests of antibodies to viruses of Newcastle disease, infectious bronchitis, fowl influenza and infectious laryngotracheitis gave negative results.

In spite of previous good general condition, the affected layers ceased to move but without any signs of locomotion system disease. The edema of eyelids and surrounding ocular tissue was recorded in over 20% of laying hens. In a greater number of birds the eyelids completely closed the eyes and the birds acquired an immobile crouching posture, refusing to eat or drink. Only a mechanical opening of eyelids was possible which revealed a slightly flattened pupil and severely inflamed conjunctiva. Affected birds breathed with an opened beak, but in general, the respiratory disease was only mildly expressed.

Rare nervous signs (torticollis) induced a suspicion to Newcastle disease, but the results of chicken embryo inoculation were negative. Histological examination of dead or sacrificed ill birds (larynx, lungs, brain, liver, kidneys) did not indicate the presence of any virus. Bacteriological examination of the head subcutis only rarely revealed the presence of *Esherichia coli*, serovar 078, a common poultry pathogen.

However, it should be pointed out that the disease-induced changes were very pronounced, what can be explained by impaired general resistance of poultry at the time preceding sexual maturity and during the development of disease.

Other stimulating factors were an unexpected, very high, almost summer-like air temperature (up to 35°C)

and an excessive stocking rate. It was impossible to achieve an adequate air temperature in spite of full engagement of aeration system.

The first attempts to treat the disease included the antibiotic therapy, again streptomycin and gentamycin, in addition to polyvitamin additives (Muvisel, BCK-Sel and AD3E), but without satisfactory results. It is uncertain whether the signs of this disease would be even more pronounced without the use of the above mentioned medicines. At the same time, i.e. after 18 days from the emergence of disease, a rigorous and safe elimination of all clinically ill birds was performed. Such procedure which is applied at the first signs of disease is the only recommendation and a positive experience gained from veterinary experts from other countries. At that time a specific, recently developed vaccine was not available.

In 1989 started the use of a specific vaccine, first in turkeys (Cook et al., 1989 a, b, c) and then in hens (Buys et al., 1989; Schildeger and Bruckler, 1989; Goater, 1989). The number of both dead and sacrificed birds per each poultry laying house on investigated farm, are presented in Table 1.

During only 18 days from the start of disease 7782 birds died (18.41%), out of which 7597 were layers and 185 cocks. In relation to total number of birds the mortality rate in layers amounted to 20.27%, 3.89% in cocks respectively.

EXPERIMENTAL THERAPY WITH ASCOGEN^R

After the unsuccessful therapy of SHS with antibiotics and vitamin additives, the recommended quantity of 500 ppm of Ascogen^R was added to feed for layers in

poultry-houses II, IV and VI (test group - T) and administered for six month till the end of their technological life, i.e. 56 weeks of age. The efficacy of Ascogen^R was assessed on the basis of general health condition (recidivation, mortality rate, number of runts which were excluded from further breeding). In addition, egg production and feed consumption per egg were recorded separately, and the quality of hatching eggs was assessed according to the hatching rate and vitality of hatched chicks. Layers in poultry-houses I, III, and V were used as control group (C), as Ascogen^R was not added to their feed.

RESULTS

The results of use of Ascogen^R in AA broiler breeders, are shown in Table 2.

All flocks were prematurely excluded from further production when the trial group had an egg yield of 49.33% compared to the control group which had 48.11%, due to farm reconstruction.

The hatching rate of eggs was increased by 1.54% on an average in the test group of breeders given Ascogen.

The individual results per each production month (from July 1989 to January 1990) are presented in Table 3.

Table 2. Production results in the control and test group of layers

Tablica 2. Proizvodni rezultati u kontrolnoj (K) i pokusnoj (P) grupi nesilica

Month and year Mjesec i godina	Egg yield (%) Proizvodnja jaja (%)		Feed consumption (g/egg) Potrošnja hrane (g/jaje)	
	Control group Kontrolna grupa	Test group Test grupa	Control group Kontrolna grupa	Test group Test grupa
1989				
VIII	76.32	76.60	259.99	249.29
IX	75.48	78.42	258.62	248.75
X	68.03	69.03	288.90	281.15
XI, XII and I/1990	48.11	49.33	437.38	399.24
Average: Prosječno:	61.01	62.64	329.05	312.50
C:T ratio K:P odnos	100.00	103.16	100.00	94.97

Table 3. Egg yield and hatching rate in the control and test groups of layers during 7 months of egg production (%)

Tablica 3. Proizvodnja jaja i stupanj valivosti u kontrolnoj i pokusnoj grupi nesilica tijekom 7 mjeseci proizvodnje jaja

Month year Mjesec godina	Observed egg yield Ustanovljena proizvodnja jaja		Observed hatch rate Ustanovljen stupanj valivosti		Expected hatch. rate Očekivani stupanj valivosti		Hatched runts Izleženi krčljavci	
	T-P	C-K	T-P	C-K	T-P	C-K	T-P	C-K
VII	58.82	61.71	-	-	89.00	89.00	-	-
VIII*	76.60	76.32	88.90	87.85	91.00	91.00	1.07	1.12
IX	78.42	75.48	87.70	85.47	88.00	88.00	0.66	0.98
X	69.03	68.03	86.91	85.75	86.00	86.00	0.87	0.98
XI	58.15	57.24	79.10	77.93	84.00	84.00	1.03	1.30
XII'89	47.92	46.76	75.80	74.10	81.00	81.00	1.42	1.89
I'90	41.84	40.33	70.40	68.91	79.00	79.00	1.40	2.09
Aver. Prosjek**	61.99	60.69	81.46	79.92	-	-	1.07	1.39

* Start of administration of Ascogen^R

Početak davanja Ascogen^R

** For the period August 1989 - January 1990

Za razdoblje od kolovoza 1989 - siječanj 1990.

The mortality rates in test and control layers are presented in Table 4.

Table 4. Mortality rate in the test and control groups of layers during the interval of use of Ascogen (cumulatively in %)

Tablica 4. Stupanj smrtnosti u pokusnoj i kontrolnoj grupi nesilica u vrijeme primjene Ascogena (kumulativno u %)

Month/year Mje- sec/godina	Laying hens Nesilice		Cocks Pijetlovi	
	test pokus	control kontrola	test pokus	control kontrola
VIII/89	2.58	2.57	7.26	7.20
IX/89	3.89	4.28	13.92	17.71
X/89	4.67	5.49	20.15	26.43
XI/89	7.22	10.27	23.05	31.14
XII/89	9.77	15.05	25.95	35.95
I/90	12.32	19.83	28.85	40.76
Average Prosijek	2.05	3.31	4.81	6.79

The data of Table 4 (mortality rate) are presented in Fig. 1. and of Tables 1, 2 and 3 (egg yield, hatching rate and number of stunted chicks) in Fig.2.

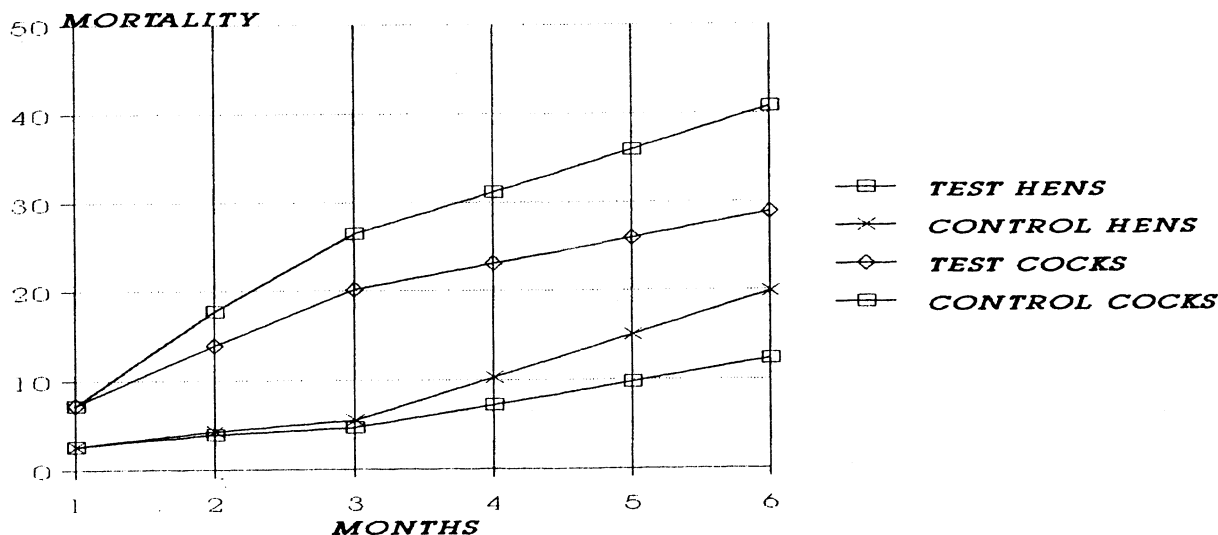


Fig. 1. Mortality rate in the test and control groups of layers during the interval of use of Ascogen (cumulatively in %)
Slika 1. Smrtnost u pokusnim i kontrolnim grupama nesilica u vrijeme upotrebe ascogena (ukupno u %)

DISCUSSION

The disease which has been observed in the flock of breeding hens, hybrids of heavy breeds, by its clinical picture and pathomorphological finding corresponds to swollen head syndrome in hens (O'Brien, 1985; Jones et al., 1987; Picault et al., 1987; Gough et al., 1988). The infective organism of this disease causes rhinotracheitis in turkeys (Heller et al., 1984; O'Brien, 1985; Hafez, 1987; Wyeth et al., 1987). Clinical manifestation of disease occurred immediately after full development of sexual maturity and prior to the start of egg production. In our case, the mortality rate amounted to 18.41% during only 18 days of disease duration, of which 20.27% of deaths were recorded in layers and 3.89% in cocks, what is in agreement with the description of swollen head syndrome (Perelman et al., 1988). After a rigorous selection and safe removal of all clinically ill birds, further spreading of disease stopped abruptly. It still persisted in a milder form in the control flock where no Ascogen^R was administered.

During the next six months the mortality rate in the control group was 19.83% in hens and 40-76% in cocks respectively. Egg yield was reduced by 1.30% on an average and hatching rate by 1.54%. In the Ascogen^R

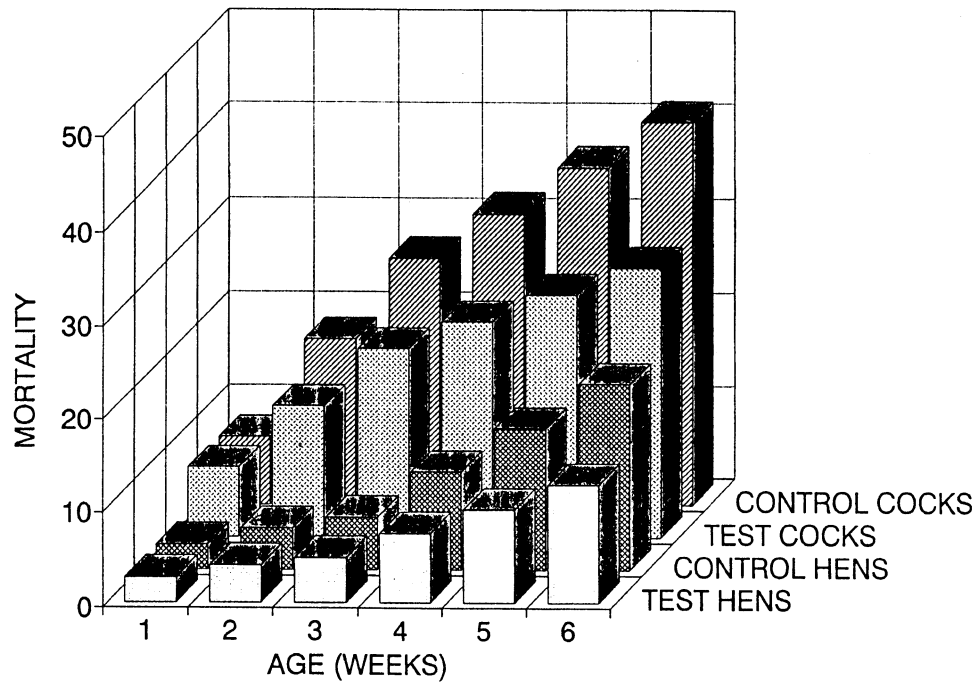


Fig 1a. Mortality rate of layers during administration of Ascogen[®] (cumulativ)

Slika 1a. Smrtnost nesilica u tijeku davanja Ascogena[®]

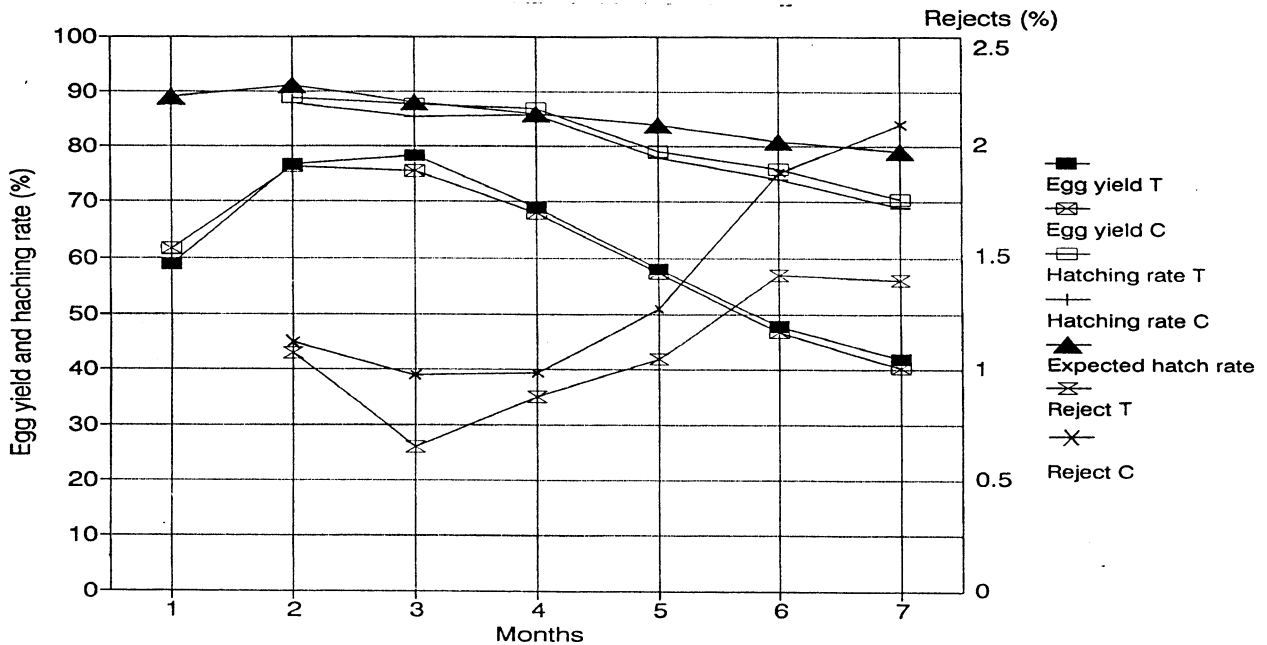


Fig. 2. Egg yield, hatching rate and number of rejected chicks in the control and test group of layers feed the mixes with addition of Ascogen[®]

Slika 2. Proizvodnja jaja, stupanj valivosti i broj odbačenih pilića u kontrolnoj i pokusnoj grupi nesilica hranjenih smjesama s dodatkom Ascogena[®]

group the mortality rate of hens was 2.05% compared to 3.31% in the control group. In the same period of time 4.81% of cockerels died in Ascogen^R and 6.79% in the control group.

Frequent cases of arthritis of bacterial etiology occurring before sexual maturity, may have contributed to the development of swollen head syndrome. Low titres of hem inhibition antibodies in the blood serum of breeding hens (HI 1:^{2,29}), in spite of repeated vaccination against Newcastle disease, should be attributed to immunosuppression, probably caused by toxic substances contained in feed (mycotoxins?).

The antibiotic therapy, frequently mentioned as useful (O'Brien, 1985), failed to produce a satisfactory response in the treatment of swollen head syndrome (at least as regards its clinical, bacteria-induced manifestation). A prolonged use of streptomycin and gentamycin caused the resistance of either conditionally or obligatorily present pathogens (*E. coli*, serovar 078).

Although the swollen head syndrome was not confirmed by serological tests, the clinical picture and pathomorphological findings in ill birds were sufficient for a correct diagnosis.

With the use of Ascogen^R in feed at 500 ppm level in three flocks on the farm (16.292 layers and 2.048 cocks), the general health condition of poultry was improved. Clinical signs of disease, swelling of the head, depression, loss of appetite and increased mortality rate, almost disappeared.

Production results clearly showed the efficacy of Ascogen^R used in breeding hens affected with swollen head syndrome. Due to improved health condition, the egg yield in test layers was increased by 41.750 hatching eggs compared to the control group. Increased hatching rate by 1.54%, compared to the control group, resulted in 25.385 more day-old, vital chicks. At the same time, feed consumption was reduced by 22.550 kg of feed. It is also necessary to mention that the mortality rate was reduced, as well as the number of stunted chicks (by 7.51%) for elimination. Considering the cost of Ascogen^R (in total 225 kg were used) the economical gain, resulted in a 8.16 times higher production value.

The mode of action of Ascogen^R has still remained incompletely explained. It is, however, well known that it presents no risk to animal health (Fuchs and Šoštarčić, 1989). Although it has been limitedly used for some years (Kos and Wittner, 1982 a, b; Mazija, 1984., unpublished observation), the experience gained is satisfactory and enables to make certain conclusions regarding its mode of action. The Stimulation of animal immune

system (a significant increase in lymphocyte count in the spleen) is undoubtedly a reliable evidence of satisfactory effects of Ascogen^R on the health of hens (Ramadan et al., 1989; Anon, 1989). In our case, it offered a possibility of exerting a non-specific effect, which resulted in significant alleviation of clinical signs of swollen head syndrome and consequently, in the improvement of production results.

It should be mentioned that Ascogen^R belongs to the group of rare substances which are compatible with different feed additives and that it does not produce adverse side effects. Future studies should be aimed at detailed investigation of the mode of action of Ascogen^R. Nevertheless, its use so far has been shown to be justifiable.

This described case of swollen head syndrome in heavy breed layers is only one of very similar clinical cases which have been recorded in broilers and hens in Slovenia and Croatia since 1987 (Mazija, personal observations). If we take into account that the first description of rhinotracheitis in turkeys in Croatia was given by Bidin et al. (1990), it is obvious that the pneumovirus which is a common infective organism of this disease in hens and turkeys (Jones et al., 1987; Gough et al., 1988; Buys et al., 1989) is present in many flocks. Extensive epizootiological investigations will be necessary in order to determine the extent to which it has already been spread.

Irrespective of the possibility of specific disease prevention in hens and turkeys with the use of either live (Cook et al., 1989 a, b, c) or inactivated vaccine (Goater, 1989) other options should also be taken into consideration. One of available options is the vaccinations of hens against infectious bursal disease and Marek's disease, aimed at the protection of animal immune system. Another option, described in this paper, is the use of different probiotics. Ascogen^R has been found to exert satisfactory effect on the general health condition of hens and consequently, its use in practice is justifiable. However, it is necessary to investigate the efficacy of other agents as well. Our recommendation is to use only those agents which, in addition to beneficiary effect, also do not produce adverse side effects.

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SAŽETAK

Opisana je pojava sindroma otečene glave u rasplodnih kokoši hibrida teških pasmina. Po kliničkom očitovanju te patomorfološkim makroskopskim promjenama, bolest se nije razlikovala od opisa što ga navode drugi autori. Za svega 18 dana trajanja bolesti uginulo je 20,27% nesilica i 3,89% pijetlova, ukupno 18,41% jata. U dijelu jata primijenjeno je u hranu 500 ppm probiotikuma Ascogen[®] (Chemofarma LTD, Augst, Švicarska), tijekom šest narednih mjeseci, čime su suzbijeni klinički znakovi bolesti. Za razliku od netretiranih jata, u onih gdje je primijenjen Ascogen[®], zabilježeno je manje uginuće kokoši za 1,26%, pijetlova za 1,998%, ostvarena veća nesivost za 1,30%, proizvedeno 1,54% više jednodnevni pilića te smanjen utrošak hrane po proizvedenom jajetu za 5,03%. U odnosu na uložena sredstva (cijena koštanja Ascogen[®]) ostvarena je 8,16 puta veća proizvodna vrijednost. Opis sindroma otečene glave u kokoši, prvi je u Hrvatskoj.

Glavne riječi: sindrom otečene glave, kokoš, probiotik Ascogen[®]