

MANAGEMENT PROBLEMS IN THE FARMING OSTRICH

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Recent interest in ostrich farming increased the demand for information about this species and how to manage it in a commercial environment. This bird is unique, being the largest living bird, measuring up to 2.75 m in height and up to 150 kg in mass. The bird is unable to fly, but the structure of the wing bones, the presence of air sacs, some pneumatic bones and presence of the pygostyle, strongly suggest that the ostrich evolved from a flying ancestor. The ostrich spends its time walking around its environment, only running if threatened. These birds can reach the speed of approximately 60–70 km/h. The leg anatomy reflects the walking lifestyle of the ostrich and it has only two toes. Our collection of information started with some particular aspects of ostrich chick biology (chick quality, residual vesica felea, growth rates, mortality, leg problems, post-hatch) having significant impact on the rearing systems employed. This aspect of husbandry is a critical phase of commercial production, was in the past and remains today the cause of significant problems in the majority of countries where ostrich farming is a novel enterprise. There is a wide variety of different rearing conditions, all of which are successful to different extent. As it is common with commercial poultry production, the best results are achieved with the highest quality day-old chicks. In this work the authors try to connect collected information and their personal field experience in rearing 3 months old ostrich chicks from France during quarantine time as well as later, during application of some prophylactic and therapeutic measures including patho-anatomy and laboratory examination.

Key words: ostrich; characteristic and farming

ПРОБЛЕМИ КОИ СЕ ЈАВУВААТ ВО ОДГЛЕДУВАЊЕТО НА НОЕВИ

Фармското одгледување на ноеви предизвикува зголемен интерес за информации за овие птици и како да се менаџира со нив во комерцијални средини. Оваа птица е уникатна. Таа е најголема жива птица, висока до 2,75 m и тешка до 150 kg. Не е способна за летање, но структурата на коските на крилата, присуството на воздушни кеси, неколкуте пневматизирани коски и присуството на тртката, укажуваат на тоа дека нојот еволуирал од предок кој имал способност да лета. Нојот времето го поминува одејќи полека во својата средина и трча само кога се чувствува загрозен. Овие птици можат да постигнат брзина од околу 60–70 km/h. Анатомијата на нозете е поразвиена поради тоа што нојот целиот живот оди и има само два прста. Нашите информации почнуваат со неколку посебни аспекти од биологијата на пилињата на нојот (квалитет на пиле, резидуална жолчна кеса, однос на растење, проблеми со нозете, период по ведењето), кои имаат големо значење во користените системи на одгледување. Почетната фаза во одгледувањето претставува критичен период во комерцијалното производство и е причина за значителни проблеми во повеќето земји каде фармите за ноеви се нов бизнис. Има многу варијанти во условите за одгледување. Во поглед на комерцијалното одгледување на живина најдобри резултати се постигнуваат со еднодневни пилиња кои се со највисок квалитет. Во овој труд авторите се обидоа да ги соберат информациите и искуствата во однос на условите на одгледување на 3-месечни ноеви пилиња од Франција во време на карантинот и во периодот потоа, во текот на профилактички и терапевтски мерки, вклучувајќи ги патоанатомските и лабораториските испитувања.

Клучни зборови: ноеви; птици; пиле; карантин

INTRODUCTION

The author of the ostrich feasibility study (M. Gačić 2002) and a co-owner of an ostrich farm, has studied in detail the economic justification of ostrich breeding in the conditions of the examined region. The conclusion was that an excessive research needs to be carried out in order to determine if it is a profitable branch in livestock production, taking into consideration that all scientific articles, presentations and other publications in journals uniquely agree on the fact that there is a lack of research works on these birds in farm breeding conditions.

In the field of agricultural and veterinary services there is a need to gain new experiences and knowledge about this type of production for students and others who wish to be informed (S. Mitrović et al. 2008, 2009; V. Teodorović et al. 2002; Biljana Miljković et al. 2003, 2004).

Brief reviews of some of the characteristics which differentiate the species are following:

Birds used to fly, now flightless, runners – Ratites (Merrem 1813). The size of the eggs is unusual with an average weight of 1545 g and can vary in size from 1–2 kg (D. C. Deeming, 1993). Anatomy of the legs determines their life style of movement and they are unique compared to other birds, because they have two fingers for reliance on the legs and can run 60–70 km per hour. By their size they are the largest among birds, more than 2.75 m (D. C. Deeming, 1999). The presence of some pneumatic bones, poorly developed wings without pectoral muscles, the sternum without the Bursa, the presence pygostyle, 9 air bags, are indicating their ancient ancestor (Cramp et al., 1977).

They do not have *glandula uropygi*, collarbone (King and McLelland, 1984). The first toe has two phalanxes, the second finger is also a two-phalanx one and the third smallest finger has only one phalanx (Friant, 1959). The lymphatic system has afferent and efferent vessels. The lymphocyte tissue is accumulated locally in the digestive tract. (King and McLelland, 1984). The lymphocyte tissue consists of thymus from 2 to 4 flaps located in the neck. Thymus is the largest during the young hood and later with sexual maturity involutes. Berens von Rautenfeld and Budras (1982) have researched the cloacal *proktodeum* of *Bursa Fabricius* and found that it is not functional.

The spleen exists but it is not yet known whether there are any lymph nodes. The only data

on the structure of the lymph nodes are given by MacAlistera in 1864, who described the lymphatic structure associated with the thoracic air bag in the form of sept. The average body temperature is 39 °C (38 – 40 °C). Since ostriches do not have sweat glands they regulate the heat by increasing the speed of breathing and evaporation through the lungs without increasing the compulsory introduction of oxygen. It is known that the respiratory rate is slower than in other birds. It changes depending on the warming of the body. The respiratory system should be investigated in order to clarify the occurrence of inflammation of the air pouch.

The digestive tract consists of oesophagus, proventriculus ventricles with 30 cm long glandular area, 80 cm long duodenum, 1.6 m long jejunum passing over to Meckel's diverticulum and over the extended part of the cecum. The largest part of the intestines, the ileum is 4 m in length, which passes in the ileo-rectal part with 90 cm length and is extended and widened caudally in the rectum or colon of 16 m length. The newly hatched chickens have 1:1 rate of intestines and rectum, 1:1.5 in the 3rd month and in 6th month, this ratio reaches a ratio of 1:2. The liver has no gall bladder.

In Ex-Yugoslavia in the 19th century there was an attempt at breeding ostriches in Vis Island (M. Šimpraga, Eleonora Peter, 2002).

Today, in Serbia, the number of ostrich breeders began to increase due to the import of ostriches from Hungary and later, Italy, Israel, Belgium, France, Spain and Croatia. New farmers are predominantly located in Vojvodina, while in other parts of the country there is a small cluster of private farms. There are examples of birds as a hobby with two to three females and one male.

The priority in import is the protection of human health, animal health, especially birds and therefore each import of ostriches goes through quarantine of 21 days.

We have investigated one of such quarantines, and our experiences are presented in this work (Biljana Miljković et al., 2004).

MATERIAL AND METHODS

Material

Ostrich chicks imported from France 3 months old, followed by 21 days quarantine. After the quarantine the breeding of the ostriches was

monitored for another 3 months, on a different location in another epizootiological area.

The study samples (dead ostriches) were shipped to the institute by the veterinary inspection and the Institute experts after the clinical examination.

Methods

During and after the quarantine, the following examinations were conducted:

Pathomorphological examinations of the diseased chicks. Microbiological examinations of the feces, swabs from the cloacae, eyes and throat, internal organs (heart, blood from the heart, the liver, the spleen, the stomach and the intestines) on the standard bacteriological media and media for yeasts and moulds.

Parasitological examinations. Samples of the intestines were examined in presence of adult forms or eggs of parasites with the standard techniques, the feathers were also examined in the presence of ectoparasites. The determination was done by the morphometric method.

Serological examination. The blood was examined in the presence of the virus of the Newcastle disease using the method inhibition of haemagglutination with the La Sota virus antigen and rooster erythrocytes (OIE Manual, CH 2.1.15.2004) in rapid serum agglutination with antigens (Intervet) for *M. gallisepticum*, *M. synoviae*, and *Salmonella gallinarum-pullorum* (Veterinarski zavod, Zemun) as well as and antigens against infective bronchitis using the immunoenzyme test with IDEXX plates.

Virusological examinations. Using the laboratory technique, 9 day old chicken embryos were inoculated with the processed sample of brain from a 6 month old ostrich chick. During two passages for 96 hours, the allantoic fluid has been extracted and examined on haemagglutination of rooster erythrocytes for identification of viruses. (OIE Manual, CH 2.1.15.2004).

RESULTS AND DISCUSSION

Breeding of the ostrich chicks depends on the quality of the chick (Selenić-Minet Dubravka 2003). The quality of the chick depends on the health of the parent birds, nutrition of the parent

birds, handling of the eggs, storage of the eggs until placement in the incubator, the process of the incubation together with the parameters of the incubation station, nutrition of the chicks and veterinary sanitary conditions in which the chicks are bred.

The season for laying eggs is in June and February and lasts on average 120 days, even though this period may vary. The eggs were collected in the evening because of the higher hatching rate. The number of the layer eggs in a season may vary from 20 to 50 eggs. The longest period for an egg collection is 10–14 days at the beginning and the end of the laying season, while this period is shorter at the peak of the laying season. The influence of different disinfection protocol of the eggs was published by Schalkwyk et al., 1998. The eggs should be clean, fumigated before placement in the incubator. The storage of the incubation eggs according to Swart 1978 at a temperature of 20–23°C up to 14 days have no or little effect on the hatching results. In Israel the eggs are stored at 15–16 °C for 1 to 7 days. Brand et al., 1998, suggest that the eggs before are heated at a temperature of 36°C for 4 hours, and then stored for 6 days at 17°C. The position of the eggs does not have any effect on the hatching result.

After incubation of 38 days, the eggs were examined under the lamp and if the beak is in the air sack the eggs were transferred to the hatchery and kept for 42 days (there are possible exclusions of 2–3 days depending on the weight of the eggs). In the hatchery the temperature was 1°C lower than the incubator. The chick had to penetrate the eggshell without any help; in case of unnatural position of the chick in the eggs assistance is allowed. The chick stayed in the egg until the umbilical cord is completely dry and falls off, and until it gets the fluffy look and is strong enough to stand, at least 24 hours. The chicks were removed out of the hatchery immediately because any delay may lead to dehydration, lethargy or apathy. The hatchery is cleaned and disinfected, and the chicks are placed in a clean and open space (Selenić-Minet Dubravka, 2003). The floor in this room should be rugged, never smooth, in order to prevent sliding of the chicks. The floor must be free of sand, not to cause problems with food passage and obstruction of the stomach, nor with straw to avoid *vesica felea* infections. After 10 weeks the chicks can be placed on sandy surfaces but they should be monitored not to eat the sand out of curiosity. The

most convenient is the perforated floor made of plastic or rubber with wholes for urine and feces drainage. The mat with drainage will give some heat and will prevent cold while the chicks are lying, as well as infections of *vesica felea* and loss of metabolic activity and grouts stimulation. During the first 7 days the temperature at the heating lamp should be 35°C and 21–24°C in the room, in 2–4th week 30–32°C under the heat source and 21–24°C in the room. In 4–6th week the room the temperature should be 9–21°C and 27–30°C under the heat source. In 6–8th week it should be 24–27°C under the heat source while in the room it should not be under 19°C (Selenić-Minet Dubravka, 2003). Cold can cause hypothermia, while over-heating can cause hyperthermia, in both cases leading to death.

The ill chicks are grouped watching other chicks surrounding them. The light should be natural or a fluorescent lamp of 100 Hz. During the night the lamps are turned off to let the chicks sleep. If light is not turned off the chicks can get nervous, unhappy, uninterested and may decline food. The care for the chicks should be provided by the same workers and as it is in other poultry production, the same principals of hygiene of clothes, shoes and disinfection are applied and the entrance of unauthorized persons is strictly prohibited. The chicks must be divided by age categories from the 3rd day of their life and the number of chicks per square meter must be 5–6 chicks on 22 m² for 6 month old ones (Selenić-Minet Dubravka, 2003).

We started the quarantine with the import of the 3 month old ostrich chicks (Biljana Miljković et al. 2003, 2004).

The clinical signs detected were symptoms of omphalitis with retention of *vesica felea*, pain in the abdomen, lower food and water intake, hard feces and death rate. The findings by *post mortem* examination were gastric retention, described as acute gastric seizure, accompanied by bacteriological findings of *E. coli* and *Pseudomonas aeruginosa*. Antibioqram was made on the isolated bacteria and the appropriate antibiotics were administered. The antibiotic therapy was applied intramuscularly.

Due to the retention in the intestines, we tried to put mix of 1 part oil and 9 parts hot water directly in the stomach with gastric probe, to help activate the peristaltic. It was probably too late for therapy. The chicks were transported from range

and were fed during the transport from France that consequently made the gastric retention. The chicks were closed during the night in the area covered with itison which they pecked by the fibres which later were moistured with water and detained in a very small volume of the stomach.

The chicks during the quarantine were treated with Vitoligam and AD3 vitamins in drinking water, fed with starter feed mixture imported from France (12% cellulose, 18% protein of vegetable origin only, 3% fat with the addition of 10–12% premixes) and with chopped fresh clover.

On a basis of the advice of the owner of ostriches from France, chicks up to 3 month old were supposed to take 3–4 kg of food for 1 kg of growth, with age of over 6 month 5 kg of food, and from 8–12, 4.5–6 kg per kilogram of the body weight gain. The expected weight of the 12 month old ostrich is about 100 kg. The ostriches in quarantine were given water from the external side of the fence as fresh made vitamin-mineral solution. The chickens were in contact only with persons who have worked in the building during our occasional visits. In the quarantine, an enclosed space was formed in the same room for the clinically diseased chickens.

Occasionally we have helped chicks to walk, by holding them in the area below the pelvis and chest (not the wings). The appearance of the scuttle symptoms in ostrich can be related to the lack of food, or stress, anxiety, boredom which should truncate the permanent teaser with items that they are not able to swallow.

Gastrointestinal disorders in intensive farm breeding conditions were the dominant clinical and pathological-morphological picture of mortality in the breeding stage production, which can go up to 50% (D. C. Deeming, 1999; B. Perelman, 2002). Nutrition of ostrich is more art than science at least according to the written expert literature. The digestive tract unlike the other birds has the ability to digest cellulose as ruminants (Huchzermeyer F. W., 2002).

They do not feed as other poultry in the intensive breeding since their digestive tract differs anatomically and functionally. They stock and acidify the food in the pregaster. The stomach with a gentle horny layer is more suitable for rough grass and taph fibres than grains. A large part of the intestine, cekum and the upper part of the colon are spacious for fermentation. This feature

allows ostriches to digest the cellulose more efficiently than ruminants. (Swart et al., 1993).

In further monitoring of the farm, the arrived older ostriches were from Belgium and were housed separately from those ostriches from France. Quarantine was monitored by other veterinary service.

In the microbiological examination of the organs (heart, liver, kidney, spleen) from dead ostriches about 2 years old (male and female) and cloacal swab and samples of feces from other ostriches, we found the dominant presence of *Escherichia coli*.

In a feces sample *Salmonella typhimurium* was isolated in hepar of 6 months old dead ostrich. These findings in room injured ostrich were related to the nearby nest of wild pigeons. This was the reason to remove pigeons.

Bacteriological and mycological examinations of a two year old ostrich throat swab, with swelling around the neck showed the presence of *Staphylococcus aureus* and *Escherichia coli*, without the presence of fungi and molds. As mentioned in the literature, sporadic occurrence of Newcastle disease (D. C. Deeming, 1999; B. Perleman, 2002, oral communication Selenić-Minet Dubravka) which may be accompanied by the skin form of Newcastle disease in the form of plates on the skin and nervous forms with the appearance of opisthotonus, twisting of head, falling of the head with paresis and paralysis were noticed. Out of curiosity, we covered a sample of brain from the dead ostrich about 6 months of age, from the same group same as the ostrich with the swelling neck. We isolated the Newcastle disease virus by the process of double passages in pigeon embryos using rooster erythrocytes as an indicator for agglutination, (Č. Rusov, 1998). Clinically, we followed the occurrence of the neck swelling, which withdrew without any intervention.

By the serological examination of blood at the same time we found the presence of antibodies by using antigen for *M. Gallisepticum*, *M. Synoviae*, *S. gallinarum-pullorum* and infectious bronchitis.

By the microbiological examination of the eye swab from swelling of the upper eyelid, and the third eye flap that was pulled off at the half of the surface of the eye, we didn't isolate the pathogen because of the antibiotic therapy, drops and ointments for the eyes were already in progress. The outcome of treatment was satisfactory. There

are frequent occurrences of the problems with the eyes because of possible injury, dust and often rubbing the head of the ostrich body which is dirty with mud and feces.

Problems with injury of the foot, breaking the leg bones, lameness, pluck of feathers, split of the neck skin, picking each other, can appear in the technology of farm breeding of ostriches. Leg injuries are common in rough terrains, in the terrains that are not specifically processed so they can dry faster after the rainy periods. The double fence with distance between each is placed around the rectangular outlet for ostriches with different age categories and different flocks, to prevent fights between males.

The presence of laboratories at the farm breeding and exploitation of ostrich can give benefit to the farmers. Experience and knowledge in poultry production can be applied to this production.

It should be mentioned that during the research we found two types of ectoparasites that multiplied rapidly and greatly harassed all age categories of ostriches. They were malofaga: *Menopon gallinae* and *Menacanthus stramineus* (I. Pavlović, et al., 2004). Infestation was successfully cleaned with the application of adequate acaricide twice. As a result of infestation, we had a lack of feathers and exposed skin, but with adequate and good nutrition, there was an improvement. Malofaga finding was the result of the contact transfer, which shows little specificity of host and parasites in a large number of bird species in our environment.

Testing of feces for the presence of parasites is a preventive way to discover heterahidosis, amido-stomosis, askaridosis, and capillariosis. The appearance of relaxed wings at the age from 5–6 months may indicate the existence of parasitic infection. Therapy in the three-day duration is for prophylaxis, while the five-day duration is therapeutic.

Huchzermayer F. W. (2002), notes that per oral antibiotics should be avoided because of the disorders of the beneficial micro flora in the bowel thus providing conditions for reproduction pathogenic fungi. The diseases caused by fungi are aspergilosis and diseases of the respiratory system, air bag.

Candidiosis occurs with changes in the mouth and oesophagus, air bags and even in the lungs. Zigomycosis is mainly localized in the stomach

with inflammatory and necrotic processes and the area of gland and muscular stomach with accumulation of white gelatinous mass with thickness of 15 mm. (H. L. Chute and Richard J. L., 1991; B. Perelman and Kuttin E. C., 1992). Infection of the skin of the neck may be the result of trichophytosis. Most fungi are saprophyte and are in the environment, and mats and the food or are part of the normal intestinal flora of healthy individuals. In terms of inappropriate farm circumstances, closed spaces, contaminated air, moisture, ammonia, temperature of the facility or the incubator, mats, stress, immunosuppression, prolonged action of antibiotics they develop as primary diseases.

CONCLUSION

Ostrich farming requires continuous exchange of new knowledge in nutrition, management, quality of meat and meat products, leather, feathers in order to obtain high quality products with a favourable economic indicator. It seems that the ostrich farming posture, semi-intensive or extensive production is far more cost-effective than intensive production (Huchzermeyer F. W., 2002).

Ostriches are well adapting to food of natural vegetation and efficiently extracting nutrients and energy. But understanding their needs by age groups still requires additional confirmation and more research is needed for vitamins and minerals.

On the 10th World Congress for ostriches held in Vienna in 2003, a Working Group was established: Ratite 13 (for ostriches, emus and ree) from the World Federation of the European scientific associations of poultry (EOC – European Ostrich Council, www.european-ostrich-council.com). Activities of this group aim to organize Ratite symposiums. The first such symposium was held in Madrid, October 2005, with aim to connect knowledge from science and industry with farmers. It is held every other year in different places in Europe. www.rattite-news-letter.com.

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