

Anatomic Study on the Main Male Reproductive Organs of Ostrich

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Abstract

In order to promote the application and extension of artificial insemination technique in ostrich industry, we carried out this research on the structure of male ostrich reproductive organs. The results of systematic anatomic observation on reproductive organs of 53 obsolete male ostriches show that: (1) For ostrich above 2 years old, the testis tends to enlarge in breeding season and shrink in ceased period. When they are mature, the color turns from milk white into the milky grey. With an average body weight 135.6 ± 6.50 kg, the ostriches have their testis 678.7 ± 20.44 g in weight and 9.6 ± 3.43 cm in length on average. (2) For 1-year-old ostriches before sexual maturity, the penis is smaller and short, shaped as a light pink bar. After sexual maturity, the testis shows a tendency of enlarging in breeding season and shrinking in ceased period. For ostrich above 2 years old, the weight of penis is 870 ± 45.63 g on average and the length is 30.1 ± 12.45 cm on average. The depth of ejaculatory groove is 19.18 ± 3.58 mm on average. (3) In cloacae, there is a less cyst cavity at the base of penis. In cyst cavity, there are two 5mm long ejaculatory mastoid processes, which have tubule connected to testis respectively. By systematic anatomic observation, constructions of ostrich reproductive organs were carefully observed, thus the further research on artificial insemination technique in ostrich could be promoted.

Keywords: Ostrich, Law of oestrus, Anatomy, Testis

1. Introduction

Currently, artificially raised ostriches were bred mainly by natural mating and showed low reproduction rate (Ren, 2003, P.110-112 & Wang, 2000, P.23-25), which seriously restricted the development of ostrich industry. As early as the 19th century, people had begun to research on ostrich. However, most of the studies concentrated on feeding and cure of diseases (Wu, 2000, P.39-40 & Zhang, 2003, P.3-4), constrained many experiments to be carried out. Since the comparatively short time of ostrich domestication, systematic anatomic studies on ostrich were rare. Some foreign countries began to do such researches in 1970s (Coli, 2002, P.63, Stornelli, 2003, P.192, Yildi, 2003, P.187-191 & Dzoma, 2003, P.81-89), but the detailed information was hard to get. China took up this new subject in 1990s (Wu, 1997 & Cui, 1999), and has already made some achievements. For example, (Liu, 2005, P.851-854), (Chen, 2005, P.185-188) and their partners conducted some researches on the cell architecture of ostrich's medulla oblongata; Wei Lan and her partners carried out anatomic experiments on the main reproductive organs of male African ostriches (Wei, 2006, P.35-37). They have proved that ostrich's penis shapes like a short club; two sides of testis are asymmetrical; and there is a phallic groove at the back of the penis. It is obvious that no studies have been carried out on the artificial insemination of technique in ostrich industry. Since the importance of anatomic study on reproductive organs of ostrich to develop such techniques, it makes the present research meaningful and necessary.

2. Material and Methods

2.1 Animals and Places

53 obsolete male ostriches aged from 1 to 4 years old selected from Guan Chi Ostrich Breeding Center, IKO Co., Ltd, and Yangling Ostrich Model Center as test animals.

2.2 Devices

Sharp knife, tulwar, scalpel, scissors, tweezers, hemostat, tape measure, electronic scale and animal operating table.

2.3 Methods

Firstly, bleed the heart of the chosen ostriches until all the blood was left out. Secondly, pluck, unplug the skin and meat. Thirdly, remove all of the inner organs. Then systematic anatomic observation on the whole reproductive system was carried out.

3. Results and Analysis

3.1 Testis

The anatomic study shows that an ostrich has two testes, each on the left and right side, which lie in abdominal cavity, on the top of the kidney. The testes are similar to each other, elliptical, and the nearer the heart, the thicker the testis. They look off-white, and the vessels can be seen very clearly on the surface. With 8-shape distribution, two testes extend forwards and backwards. Testes of sexual mature male ostriches are mainly made up of the seminiferous tubules, which is similar to that of the structure of mammal. However, the seminiferous tubules of ostrich's testis are formed like a web, but the mammals' are separated from each other. deferent duct, which is a long curved tube, moves together with ureter to the cloaca. The results are showed in Table 1.

Table 1 showed that the weight, volume and color of the testis change with the season. The average weight of ostrich above two years old is 135.6 ± 6.50 kg, and the testis 678.7 ± 20.44 g. The average length of testis is 9.6 ± 3.43 cm. When the ostrich are immature, their testes are as big as an adult's thumb and appear ivory. The weight and the volume of testis become bigger after two years old. At the dissection, we observed that the testis grows bigger during the breeding season, and smaller in the rest period. The color turns grey-white when the ostrich becomes sexual mature.

3.2 Penis

The penis of an adult male ostrich is about 26cm long, and is located on one side of the cloaca. The penis is divided into two parts, the base and the free hanging portion. The base of the penis is thick. The size of the penis at different age can be referred to table 2.

Table 2 indicates that the average weight of ostrich above 2 years old is 870 ± 45.63 g, and the length is 30.1 ± 12.45 cm. The size of the penis changes with the age and sexual activity. A 1 year old ostrich has quite small penis, shaped like a short club, and light pink. After 2 years, the penis grew bigger. The free-hanging portion of the ostrich is like a cone-helicoid, and becomes thinner from base to glans. There is a 19.18 ± 3.58 mm deep Penis 1 groove at the back. It is closed like a tube while mating and ejaculating to the fallopian tube. The size of the penis grows bigger during the breeding season, and smaller during the rest period. In the cloacae, there is a small cystic cavity at the base of the penis. Inside the cystic cavity there are two ejaculatory mastoid processes, from which tubules are connected to the testis. It is about 10cm from the base of the penis to the mastoid process. Each of the two mastoid processes is about 5mm and shaped like a circular cone. This cystic cavity stands alone in the cloacae and separates the function of excretion and reproduction.

4. Discussion

Through the anatomic observation, we come to the conclusion that the oval-type testis on each side of the ostrich is similar to each other. The left testis is thinner and longer than the right one. However, the right testis is a little heavier. Both testes appear grey-white and smooth. The blood vessels can be seen very clearly. The above results are different from that reported by Wei Lan, Wu Shilin and their partners. It is more likely because of the difference of the season, nutrition and environment the experimental ostrich chosen. However, there are some characteristics. First of all, the reproductive organs of the ostrich are much bigger than that of other poultry. The testis's color also changes with the age and the breeding season. Inside the cloacae, there is a small cyst cavity at the base of the penis, which stands alone and separates the function of excretion and reproduction. This is a great evolution compared with other poultry. And it is also one of the most important discoveries in our research.

Compared with the testis of the Western Anhui white goose (Jin, 2000, P.25-28), chicken and duck (Luo,1983), the testis of the ostrich has its own characteristics: the testis is not symmetrical, and two testes are shaped like "8". The weight and the color change a lot with the age and sexual activity. Before it reaches sexual maturity, the testis is small and appears bright yellow. But when it becomes mature, the testis turns a lot bigger, and looks like a thick grey-white ellipsoid. When it comes to the rest period, the testis shrinks and appears thinner.

The penis of the ostrich is very strong. An adult ostrich's penis can be as long as 25-30cm and looks like an awl.

At the back of the penis, there is a Penis groove, which is closed and like a tube when the penis erects. However, the penis of the duck and goose appears spirally and it forms a spiral Penis groove on the surface when the penis erects (Wang, 2008, P.37-38 & Duan, 2002, P17-18). The penis of the chicken is not as strong as that of the ostrich. It is about 2cm. Pigeon does not have penis (Chen, 2005, P.26-28). The excretion of the ostrich is also different from that of other poultry. It is detached. At the base of the penis, there is a small sac which includes urethra, seminiferous duct and coprodeu. The ostrich often has a bowel movement after urinating. But the poultry are accustomed to excreting the urine and stool together.

Due to limited conditions, the present study on the main reproductive organs of ostrich is not as elaborate and systematic, further research is still needed to promote the artificial insemination technique in ostrich industry.

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Table 1. The color and size of testis at different age stages of male ostrich

Age	Body weight (kg)	Number of samples	Weight of testis on left side (g)	Weight of testis on right side (g)	Length of testis on left side (cm)	Length of testis on right side (cm)	Color of testis
1	120.7±6.11	13	160.9±8.43	180.4±6.87	5.1±0.66	4.7±0.73	ivory
2	140.1±7.31	8	300.4±10.22	320.5±9.38	8.3±0.82	6.6±0.67	grey-white
3	130.8±6.71	10	330.8±9.67	350.8±10.24	10.6±1.01	8.2±0.95	grey-white
4	130.8±5.79	12	330.6±12.85	350.3±8.73	11.3±0.93	9.2±0.84	grey-white
5	140.6±6.20	10	350.4±10.68	380.6±9.98	12.3±0.87	10.3±0.86	grey-white
Average (above 2)	135.6±6.50	10	328.1±10.86	350.6±9.58	10.6±3.63	8.6±3.22	

Table 2. The color and size of penis at different age stages of male ostrich

Age	Body weight (kg)	Number of samples	Length of penis (cm)	Diameter of penis base (cm)	Diameter of free-hanging portion(cm)	Depth of Penis groove (mm)	Color of penis
1	120.7±6.11	13	20.7±1.15	4.16±0.21	2.53±0.09	12.96±0.67	Light pink
2	140.1±7.31	8	28.7±1.24	5.31±0.20	3.12±0.10	15.73±0.84	Light red
3	130.8±6.71	10	30.4±1.32	6.26±0.27	3.22±0.11	18.26±1.13	Light red
4	130.8±5.79	12	30.5±1.28	6.34±0.31	3.53±0.09	20.19±1.27	Light red
5	140.6±6.20	10	30.5±1.16	7.14±0.29	4.20±0.14	22.53±1.81	Light red
Average	135.6±6.50	10	30.1±1.25	6.26±0.29	3.52±0.11	19.18±1.26	



Figure 1. Testis of a four-year old ostrich

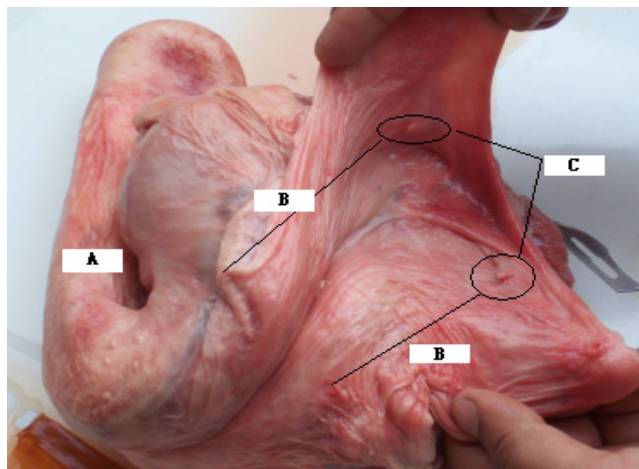


Figure 2. Dissection of cloacae

(A. Penis; B. 10cm from the base of the penis to the mastoid process; C. ejaculatory mastoid)