



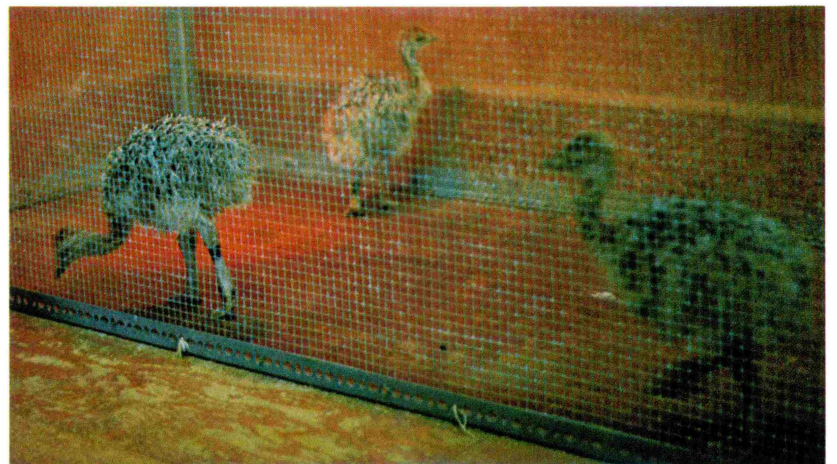
The Sears Favorite proved to be a satisfactory incubator. All incubators used were thoroughly cleaned and fumigated in March prior to egg laying in April.



Occasionally a chick would have to be helped out of the egg. Breaking the shell and peeling back the membrane was done with extreme caution.



The chick's head was extracted first so the bird could breathe.



From the 4th to the 14th day the chicks stayed in the juvenile pen that contained a heat lamp and had an indoor/outdoor carpet substrate.



To help correct an occasional spraddle-leg problem the chick's legs were taped together at the proper width.



At two weeks of age the chicks were placed in an outdoor grassy enclosure but were put inside a shelter at night.

Artificial Incubation and Rearing of Ostriches

by Tuli Diamond and Janiece Rozin

Since 1976, the Memphis Zoo has been working on a program to artificially incubate and rear ostriches (*Struthio camelus*). Our collection consists of a male which we received in April of 1976 and three hens. In 1976 we had 40 eggs laid of which 17 were fertile. Only four birds hatched, and none of these survived. The major cause of mortality was severe edema, even causing death prior to hatching. In 1977, a total of 47 eggs were laid of which 24 were fertile. Twenty-one of these eggs hatched and 15 survived. In 1977 the major cause of death was due to slipped tendons. In 1978, there were 123 eggs laid of which only 30 only fertile. All of these eggs hatched and 24 survived. Four of the 30 hatched had to be euthanized because of slipped tendons, one died from a bacterial infection and one was trampled to death. With a better understanding of nutritional requirements and animal husbandry needs, in 1979 out of a total of 57 eggs laid, 11 were fertile, 11 hatched, and 11 survived.

INCUBATION

The type of incubators used were Sears Favorite incubators, which were thoroughly cleaned in March prior to egg laying in April. All incubators during active incubation were fumigated weekly for 15 minutes with a solution of 0.6 grams potassium permanganate and 12cc formaldehyde per cubic feet. The dry temperature was 99.5°F (37°C) and the wet bulb was kept at 65°F (18°C).

The hens started laying in April and continued through September. The eggs were collected daily and washed with a 5% formaldehyde solution. The eggs were stored in a cool room at 65°F (18°C) until each Tuesday when all the eggs laid in the previous week were placed in the incubator simultaneously. The eggs were

turned once daily and never held more than one week. During incubation the eggs were turned three times per day and aired once per day for 15 minutes. On Tuesday the previous week's eggs were candled to check for development. The natural incubation time for ostriches is 40 to 42 days. Starting on the 35th day, the air cell was checked to see when the chick pipped the inner membrane. When this occurred, we began breaking them out manually. If the chick had not pipped the inner membrane by the 41st day we broke them out because experience indicated the chicks died if left any longer in the shell.

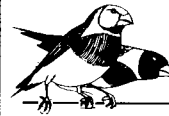
The breaking out process could take up to 24 hours. Some chicks came out much quicker, depending on how rapidly they absorbed their blood vessels and yolk sac. Breaking the shell and peeling back the inner membrane was done with extreme caution to avoid bleeding. If severe bleeding occurred, we used either a coagulant powder or silver nitrate sticks and returned the egg to the incubator for a few hours. Breaking the shell slowly also gave the chicks time to struggle and thus absorb their blood vessels and yolk sac. If the chick had not pipped the inner membrane, we looked for a wet spot which indicates where the bill is located. In the event there was no wet spot, we felt for the bill and very carefully punctured the membrane and began slowly to free the head so they could breathe. The open end of the egg was covered with a moist paper towel to keep it from drying out while in the incubator.

Upon hatching the chicks were given an injection of 0.4cc gentocin diluted to 1mg/ml intramuscularly.

Because the humidity is high in Memphis, we had an edema problem with the newly hatched chicks. Their head, legs,

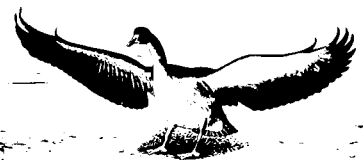
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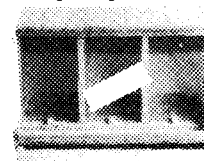
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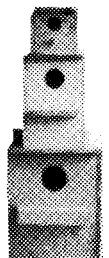
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and entire body were so swollen that it seemed to make it impossible for them to break out of the shell. The ones with severe edema were also slower to get up on their feet. The chicks absorbed all the fluid within a few days and looked normal. To alleviate the fluid problem a dehumidifier was installed in the incubator room. It appeared to reduce the edema problem and for the first time a chick pipped the outer shell on its own.

BROODER BOX

The dimension of the brooder box used was 107cm x 107cm x 50cm. When the chicks hatched they were placed in the brooder box for three days. The temperature was kept at a constant 90°F (32°C). Indoor/outdoor carpet was used as a substrate in the brooder box and the entire box and carpet were disinfected each week, i.e. between hatchings.

During the time in the brooder box, the chicks were watched carefully for spraddled legs, i.e. legs out to the side or one leg out and not staying underneath it. If this occurred their tarsal-metatarsal bones were taped parallel the width of the pelvis until they were a week old. Sometimes it was necessary to have a person stay with the birds constantly to put the chick's legs underneath their body until the chick could do it on its own. The tape was doubled on the ends so that it hung loosely around the legs and did not stick to the skin.

Banding was done with colored tape as they went into the brooder box. Every week we used a different colored tape and each chick hatched that week was banded differently with this color, i.e. right or left on both legs. The tape was changed regularly as they grew.

On the third day the chicks were placed in a juvenile pen during feeding times only. No food was ever offered in the brooder box. A chicken was used to teach the first one to eat, and subsequently the older chicks taught the younger ones.

JUVENILE PEN

The dimension of the indoor juvenile was 91cm x 275cm x 61cm and was equipped with a heat lamp that the chicks could get under. From the fourth day, until approximately the fourteenth day, the chicks stayed in the juvenile pen. The substrate here was also indoor/outdoor carpet which was disinfected daily. The whole pen was disinfected once a week. They were kept on this artificial substrate until they were two weeks old because of the incidence of grass impaction in chicks under two weeks.

Occasionally the larger or more aggressive chicks pecked on the backs of the smaller ones. In these instances we made a "sweater" out of an old sock for the injured chick which was left on until the area was healed.

The chicks were fed ½ cup per bird twice a day a mixture of six parts finely chopped spinach, one part slightly moistened ratite, and one part grated apple and carrot. A multivitamin mineral powder and rice bran were sprinkled over the food. They were only given fresh water twice daily. Uncontrolled access to water caused diarrhea. The food was gradually increased to approximately 1-1½ cups of mixture per bird, or as much as they would eat in a fifteen minute period twice daily. Too much food while restricted in the juvenile pen was attributed to causing slipped tendons, the highest cause of mortality in our chicks.

OUTSIDE

When the chicks were fourteen days old, weather permitting, they were placed in the outdoor enclosure which consisted of an ostrich house (566cm x 184cm x 184cm) and a fenced grassy lot. The house had two doors, one on either end. The top half was screened for ventilation, and a heat lamp was provided for the younger birds during weather below 50°F (10.5°C). The indoor substrate here was also indoor/outdoor carpet and was disinfected daily. The chicks were locked in the house at night and given free access to the yard during the day. They were fed ratite and water free choice in addition to a pan of chopped spinach with the multivitamin mineral powder and rice bran offered twice daily.

SUMMARY

We have found through control of temperature and humidity, a strict disinfection system, specific diet, and proper substrate, we were able to artificially incubate and rear ostriches. The major problem encountered was slipped tendons which resulted in euthanasia of the chicks. In previous years, we weighed the chicks each day and carefully charted their growth to prevent rapid growth. When the chicks grew too quickly, this put a stress on the legs which we feel caused the tendon to slip. We have found through controlling the intake of food while the chicks are in the juvenile pen, and by providing adequate exercise on a natural substrate in the outside enclosure, that slipped tendons were no longer a problem in our birds.

We wish to express our sincere thanks to Cliff Ross, Curator of Birds, for his encouragement and assistance.

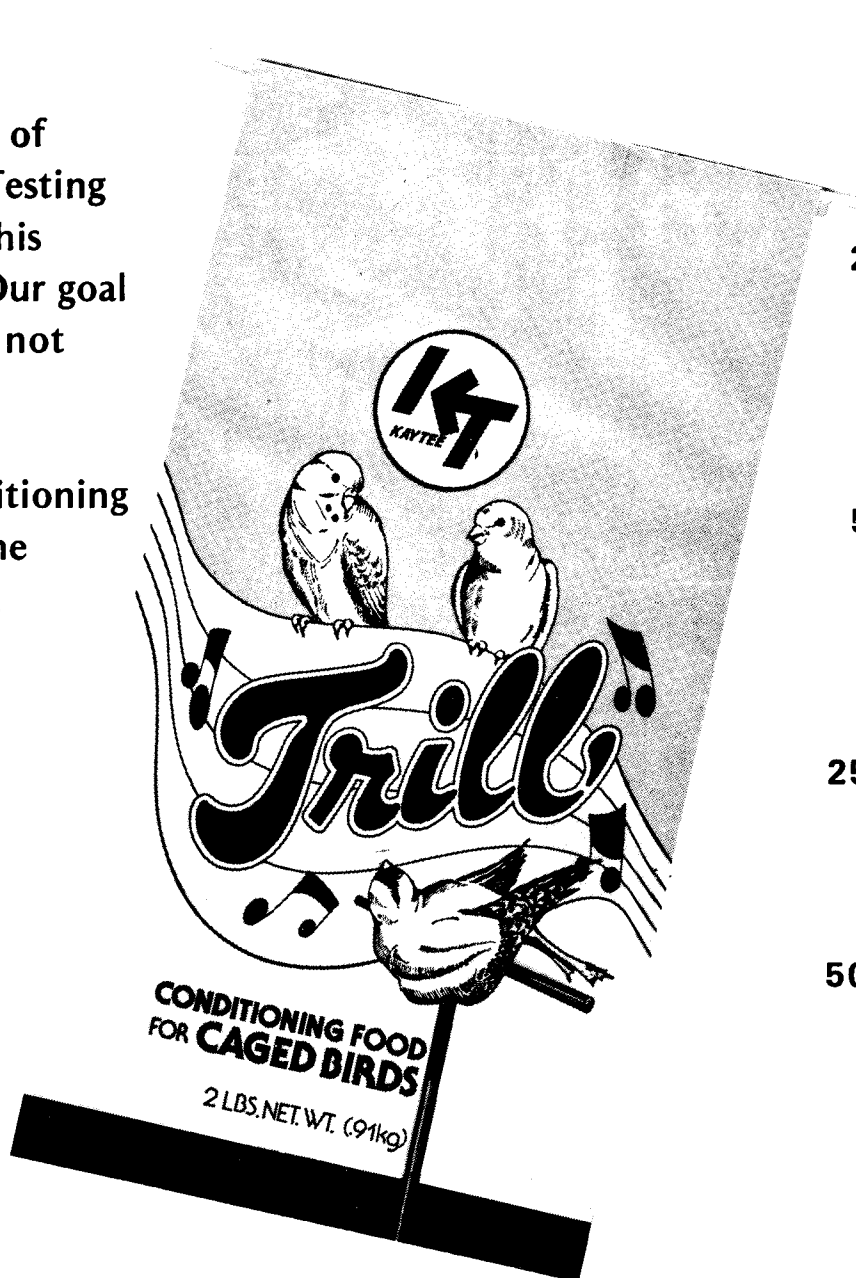
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