The Reproductive Female
Introduction

Today’s talk will lightly cover the basic female avian anatomy, then discuss some of the problems associated with that anatomy. In the end I will offer some suggestions for controlling unwanted female reproductive behaviors.

Female Reproductive Anatomy and Egg

Ovary

In most species, only the left ovary and oviduct are present. In Kiwis and some raptor species, both left and right sides are present and functional. When the hen is young the ovary is barely visible. It is attached to the left kidney and the body wall by the mesovarian ligament. As the hen matures the ovary starts to look like a small bunch of grapes, only clear. When breeding season occurs, some of the follicles start to grow rapidly. Yolk and protein produced by the liver start to accumulate in these larger follicles, making them yellow in color. During the nonbreeding season, the follicles should shrink. The body should harmlessly absorb the protein and yolk material. Older hens may never return to active reproductive status. If ovulation ceases suddenly due to stress or trauma, the developing follicles will regress.

Oviduct

The oviduct is the structure in which fertilization and development of the egg occurs. In actively reproductive females, this muscular structure becomes very thick and large. In the inactive female, it shrinks incredibly to a threadlike structure. It is connected to the body wall just under the ovary and transverses down to the cloaca. It consists of five distinct regions: Infundibulum, magnum, isthmus, uterus (shell gland), and vagina. Oviduct transit time varies among species and is approximately 24 hours.

The infundibulum catches the egg from the ovary. Fertilization occurs here. The suspensory apparatus (chalazae) of the developing embryo is added at this level. The egg spends about one hour in the infundibulum before it moves on to the magnum. This portion of the oviduct deposits most of the albumen, sodium, magnesium and calcium used in egg development. This takes three hours. Then, on to the isthmus, where the inner and outer shell membranes are added. The egg spends about two hours here.

The uterus (shell gland) retains the egg for 20 to 26 hours. During this time the egg receives salts, water, the shell, and shell pigment. The vagina is the thickest portion of the oviduct. The
vagina does not contribute to the formation of the egg. The egg spends a few seconds here before it is expelled from the body. The vagina and cloaca work together during the expulsion of the egg.

Sperm can be stored for about a week in psittacine (parrot) species. In turkeys, sperm can be stored for 40 to 50 days. It is stored at the uterovaginal junction in the sperm host glands (spermatic fossa).

Ovulation occurs shortly after an egg is laid. In psittacines (parrots), the laying interval is two days (an egg every other day). In Passeriformes (softbills), lay intervals are 24 hours, but can extend up to four or five days.

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**Female Hormonal and Physiologic Factors**

The hormones involved in reproduction and the tissues they come from are important. I am not going to discuss them in depth at this time. There are some select factors influencing reproductive behavior and egg production that I will mention in this section. Understanding a few basic physiologic facts will help in developing a plan to control unwanted reproductive problems.

Increasing day length influences the onset of reproductive behavior in temperate climate species. Photoperiod is less important in equatorial species where the day length is similar year round. In chickens, the maximum stimulation is received when light periods are around 12 to 14 hours. The hypothalamus (a part of the brain) receives signals from the optic nerve (a part of the eye). Hypothalamic control of reproductive behavior is controlled by other environmental factors. In arid dwelling species, such as budgies and Zebra Finches, drought will inhibit reproductive behaviors. During these dry conditions, when food is scarce, hypothalamic secretions suppress reproduction.

Several hormones secreted by the follicle affect the oviduct, including progesterone. Progesterone in large doses may inhibit ovulation or, if given 36 hours before expected ovulation, will induce follicular regression. If given 2 to 24 hours pre-ovulation, progesterone can cause premature ovulation. Of course this varies among species. It is best used after a complete clutch has been laid. It must be used with extreme caution as it can affect the overall health of the bird. The use of progesterone can cause liver disease.

Estrogen increases total plasma calcium levels, among other things. During the egg laying process, plasma calcium levels can be extremely high, reaching levels of 30 mg/dl. Laying hens will preferentially consume calcium-rich diets. In laying hens, it is recommended that they be fed a diet of 0.3% calcium (1:1 or 2:1 with phosphorus), but no more than 1 %. Usually most of the egg shell calcium is obtained from the intestine and bone calcium is used only when blood calcium is low.

Bone calcium does serve as a source of calcium for shell development in hens that lay eggs during morning hours. Calcification of the inner space (medullary space) of the femur, humerus and tibia primarily, occurs approximately ten days before egg formation and is driven by estrogen. If the hen does not consume enough calcium, the bone calcium will be used. At some point, calcium deficiency will stop the egg laying process. Diets high in fat will inhibit calcium absorption from the intestine. Impaired liver function may be the cause of overly calcified bones (polyostotic hyperostosis) in hens. The liver is responsible for inactivating estrogen. Excess circulating estrogen creates this chronic bone problem.
Female Reproductive Disorders

Egg Binding and Dystocia

Egg binding is defined as failure of an egg to pass through an oviduct at a normal rate. Most pet bird species lay eggs at greater than 24-hour intervals, but the exact interval varies among species. This makes it difficult to determine when there is a problem. Dystocia is defined as a condition in which a developing egg is in the caudal oviduct and is either obstructing the cloaca or has caused oviductal tissue to prolapse through the oviduct-cloacal opening. Common causes of dystocias are oviductal muscle dysfunction (calcium metabolic disease, selenium and vitamin E deficiencies), malformed eggs, excessive egg production, previous oviduct damage or infection, nutritional insufficiencies, obesity, lack of exercise, heredity, senility, and concurrent stress such as environmental temperature changes or systemic disease.

Abnormally prolonged presence of an egg in the oviduct causes a multitude of complications in the hen. The severity of these complications depends on the species, previous health, the cause of the binding, the egg’s location in the oviduct, and the time elapsed since the egg’s development began. An egg lodged in the pelvic canal puts pressure on blood vessels and nerves. It can prevent defecation and urination. This can lead to kidney damage or failure. The uterus may rupture. Circulatory shock and death can occur.

The smaller the bird, the more serious the situation. Cockatiels, budgies, lovebirds, canaries, and finches often have egg related problems. Generally the hen will appear droopy winged and wide stanced. She will be reluctant to fly or perch. There may be tail wagging and straining movements of the abdomen. The legs may become paralyzed. These birds need to visit the veterinarian right away. Do not steam these birds. Do not apply mineral oil. These things do not work at all.

Prolapse

Prolapse of the oviduct may occur secondarily to normal physiologic hyperplasia and egg laying or as a result of dystocia. Excessive contraction of the abdominal muscles, poor physical condition, and poor nutrition may cause these prolapses. Usually the uterus protrudes through the cloaca; often an egg is present. It is important to keep these tissues moist. A small amount of Neosporin or triple antibiotic ointment can be placed on the protruding tissue and then you must proceed to the veterinarian. This problem will not resolve without medical intervention. Prolapses often recur. The veterinarian may place small sutures to keep the cloacal tissue in place while it heals and the hen regains muscular strength.

Salpingitis and Metritis

Salpingitis is infection of the upper reproductive tract. This can occur through infection from other organ systems such as the liver, air sac, pneumonia, or retrograde infections of the lower uterus, vagina or cloaca. Excessive abdominal fat has also been associated with many cases of salpingitis. The infectious agent most often isolated from birds with salpingitis is E. coli. Other infectious agents include Mycoplasma gallisepticum, Salmonella spp., Streptococcus spp. and Pasteurella multocida. These bacteria are often affecting other organ systems simultaneously.

Depression, weight loss, anorexia, and abdominal enlargement can occur with salpingitis. A discharge from the cloaca may occur. The inside of the infundibulum may contain cream colored, slimy fluid, or cheesy, yellowish thick exudate. Culture and cytology are necessary for diagnosis. Cockatiel hens that have a history of egg laying followed by mild depression and weight loss may have salpingitis or focal egg laying peritonitis.
Metritis is a localized problem within the uterine portion of the oviduct. It can be a result of dystocia, egg binding or chronic oviductal impaction. Bacterial metritis is often secondary to systemic infection. Shell formation and uterine contractions can be affected by metritis. Embryonic infection can be caused by coliform metritis. Metritis can also cause egg binding, uterine rupture, peritonitis, and septicemia.

Oviduct Impaction

This is a condition in which soft-shelled eggs, malformed eggs, or fully formed eggs are stuck in the lower oviduct. It is usually a result of salpingitis, but can also result from egg binding and metritis. Usually the hen will stop egg production and slowly lose condition. There will be periods of alternating constipation and diarrhea. Periodic anorexia, reluctance to fly or walk, and abdominal enlargement (usually left side) are all signs. Endoscopy or exploratory laparotomy are usually the only way to diagnose this one. The oviduct must be surgically removed.

Cystic Ova

This is when an ovarian follicle becomes grossly enlarged and filled with fluid. Ovarian tumors and cystic hyperplasia can occur secondarily. The cause of cystic ova is not fully understood. In affected birds, difficulty breathing, altered movement, and abdominal distension are found. Cysts can rupture easily, sometimes flooding into the airsacs. I often treat these with Lupron. I do occasionally pull fluid out of the cysts to give the hen breathing space. Occasionally, I have surgically removed them.

Cloacal Problems

Inflammation of the cloaca, stricture of the cloaca, cloacal liths, and chronic prolapse of the cloaca will all interfere with egg passage. Cloacal papillomas will interfere with copulation and semen passage. Birds with papillomas should not be breeding. Treatment success for cloacal papillomatosis varies. One case was helped by a diet low in fat, and high in fruits and vegetables rich in beta-carotenes.

Parasites

Found mostly in waterfowl, this involves flukes (*Prosthogonimus ovatus* and related trematodes). Prevention involves the control of aquatic snails.

Neoplasia

Budgerigars often have neoplasia in the ovary or oviduct. Many other species have been reported with ovarian neoplasia, though with less frequency than budgies. The hen will present with similar signs to cystic ovaries or oviductal impaction. Ovarian tumors can account for up to 1/3 of body weight. Egg retention, cysts, ascites, and abdominal herniation often occurs due to ovarian neoplasia. Secondary sexual characteristics may also occur such as cere color in budgies. Radiographs may help diagnosis, but to confirm neoplasia, histopathology is needed. A variety of other tumor types have been reported including adenocarcinomas, leiomyomas, leiomyosarcomas, adenomas, and granulosa cell tumors.

Peritonitis

Peritonitis can be divided into two categories: Septic and non-septic. Whether the peritonitis is septic or not depends on whether bacteria is involved or not. In non-septic peritonitis, egg material without bacteria is free in the abdomen. Ascites may or may not be present. Treatment includes removing the egg material surgically. Septic peritonitis is much worse. It is the most frequent cause of death associated with reproductive disorders. It is most likely not one disease but part of several diseases such as salpingitis, ruptured oviducts, and ectopic ovulation. Usually
it is the yolk that introduces the bacteria into the abdomen. *E. coli* is the most common bacterium isolated. The hen will be very depressed, have abdominal swelling, difficulty breathing, anorexia, high white blood cell count, and cessation of reproduction. Death is a common finding. This peritonitis is most frequently found in cockatiels, lovebirds, budgies, macaws, and ducks.

Septic peritonitis will cause severe adhesions of the abdominal organs leading to chronic pain. Egg-related pancreatitis may cause temporary diabetes mellitus in cockatiels. A temporary stroke-like syndrome is found in cockatiels with yolk peritonitis. Yolk emboli are suspected. Treatment for peritonitis is long term. If diagnosed early, the prognosis is better.

**Anatomic Abnormalities**

Occasionally a functional right ovary is found. In Kiwis and Falconiformes this is normal, but not for the rest. Functional right ovary and oviduct have been reported in the budgerigar.

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**Behavior Modification**

**Chronic Egg laying**

Chronic egg laying occurs when a hen lays eggs beyond the normal clutch size or has repeated clutches regardless of the existence of a suitable mate or breeding season. Humans, inanimate objects (toys, etc.), or birds of another species will stimulate this behavior. The chronically active female may exhibit weight loss from constant regurgitation and feather loss or mild dermatitis around the vent in association with masturbatory behavior. In some cases removing the eggs helps: in others, it doesn’t. Egg laying is ultimately controlled hormonally. It is noted that the most domesticated birds, cockatiels, budgerigars and lovebirds are the most chronic egg layers. Perhaps we have selected for this problem by producing birds that will breed in a variety of environmental situations (selective pressure).

If a completely nutritious diet is provided, hens can lay eggs for years. In most cases, however, malnutrition and the progressive stress and physiologic demands of egg laying will ultimately destroy the hen. Calcium deficiency leads to brittle bones, malformed eggs, uterine inertia, and generalized muscular weakness. Egg binding is common. Behavioral modification must be attempted to stop egg laying. Diminish the amount of daylight hours to eight, with sixteen hours of continuous darkness. Objects stimulating sexual behavior should be removed. Nest boxes and enclosure partners should be removed. Changing the location of the enclosure and rearranging the objects inside the cage often may help. Owners may need to stop handling the hen until reproductive behavior stops (sometimes 30 to 60 days).

Medical therapy includes correcting nutritional imbalances and infections. Hormones may be used to interrupt the cycle. They are not without side effects. Lupron seems to work the best. Ultimately, if nothing works, salpingohysterectomy is the long-term solution.

Certain species will reproduce up to four times a year (mainly Blue and Gold Macaws, cockatoos and Eclectus Parrots). Egg production in excess of two clutches a year will eventually lead to the same problems associated with chronic egg layers. Extra clutches should be avoided.
Good Sources:
