The Use of GnRH Agonists in Avian Practice

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INTRODUCTION

Reproductive activities, particularly those that are recurrent, pose a significant threat to the health and behavioral wellbeing of many pet birds. When a hen lays repeated clutches or larger than normal clutch size without regard to the presence of a normal mate or confined breeding season, a myriad of secondary problems can follow. Ultimately, functional exhaustion of the reproductive tract poses increased risk of metabolic and physiological drain on the bird, particularly on calcium and energy stores. All these ultimately predispose the hen to egg binding, dystocia, yolk peritonitis, oviductal impaction, oviductal torsion, cloacal prolapse and osteoporosis. Although chronic egg laying is seen in many companion bird species, it is most described in the smaller species, including budgerigars, cockatiels, lovebirds, and finches. Medical intervention has traditionally focused combinations of environmental management, counter-hormonal therapies, and surgery. In avian medical practice, counter-hormonal therapies, including leuprolide acetate (Lupron®) and deslorelin, seem to be the more common treatments recommended for prevention as well as intervention for recurrent reproductive problems, and targeted behavioral or antecedent arrangement strategies seem to be less commonly implemented. Viewing the advantages and relative safety that is possible with the use of GnRH agonists, their use has become increasingly popular in many avian practices to treat chronic or excessive egg laying issues, and many other hypothesized conditions to be associated with sex steroid cyclicity. This manuscript and presentation will explore the anatomy and endocrinology of reproduction (largely focused on the female), the role of environmental stimuli in the activation of the hypothalamic-pituitary-gonadal axis, will forward an ethical scale for the prioritization of treatments and recommendations, treatment options including the use of GnRH agonists, and the use of behavioral science to help guide and refine treatments even further.

FEMALE REPRODUCTIVE ANATOMY AND ENDOCRINOLOGY

The anatomy and endocrinology of the avian reproductive tract is well described. The normal reproductive cycle and the clinical problems that can occur, with treatment considerations and recommendations, are described in depth in most current texts. Clinical problems are more commonly described in females as compared to males. The female bird's reproductive tract consists of the left ovary and the left oviduct. The left and right ovary and oviducts develop embryologically as paired structures, but after hatching, the right ovary and oviduct regress the domestic fowl, leaving a right ovotestes and right mesonephric duct.

Ovary

The left ovary is in the intestinal peritoneal cavity, cranial to the left kidney and adjacent to the adrenal gland. The ovary is attached to the dorsal body wall by the mesovarian ligament, which can have considerably large blood vessels during an active breeding cycle. Surgical access concerns as well as those about residual or regrowth of ovarian tissue, and threat of hemorrhage makes ovariectomy a particularly challenging procedure in an adult hen. The ovary histologically consists of two major portions: the medulla and the cortex. The medulla contains connective tissue, nerves, smooth muscle, and blood vessels. The cortex covers the medulla externally and contains the primary oocytes. These oocytes have developed from a set number of prenatal oogonia by the time the female bird has hatched. Within the ovarian cortex of the adult hen, several hundred to several thousand primary oocytes may be visible to the naked eye. About twelve thousand are visible microscopically. Very few of these will enter the stage of rapid growth and develop beyond the primary oocyte stage. Primary oocytes visible on the surface of the ovary are termed follicles, which pertain to the primary oocyte and its membranous covering. After completion of the rapid growth period, the primary oocyte undergoes two maturation divisions. Fertilization of the ovum occurs within 15 minutes of ovulation, and presumably occurs in the infundibular oviduct. The budgerigar is an example of a determinant laying species, meaning that they lay a fixed number of eggs. Many other non-domestic birds are also known to be determinant layers, such as the California condor, eclectus parrot, and bald eagle. Aviculturists may choose to take advantage of this physiologic trait and remove eggs from the nest for artificial incubation, knowing that the parents will often "double clutch" and re-create another clutch of eggs. The reverse management, providing the perception of a completed clutch to a hen, sometimes can be used as a mechanism to reduce the number(s) of eggs laid by determinate laying species that has a recognized nesting area.

Oviduct

The left oviduct is attached to the dorsal body wall by the mesovarian ligament. Glandular development within the oviduct results in a thickening of its walls which differentiate it into five functional regions associated with egg formation. These portions are termed the infundibulum, magnum, isthmus, uterus and vagina. The infundibulum is the funnel shaped structure at the proximal end of the oviduct along with a very small portion of the tubular shaped proximal oviduct. The funnel shaped portion of the infundibulum forms an elongated slit which faces the ovary. The ovulated secondary oocyte is literally swallowed or "caught" by the funnel portion of the infundibulum. This "catching" process is facilitated by the adjacent air sac which tightly encloses the ovary and forms the "ovarian pocket", leaving only the direction of the infundibulum for easy movement of the secondary oocyte. Formation of the yolk membrane's outer layers probably begins in the tubular portion of the infundibulum. These outer layers of yolk membrane are termed the chalaziferous layer of albumen and the chalazae. The magnum is the longest and most coiled portion of the oviduct. It is distinguished by its greater external diameter and markedly thicker wall caused by the presence of numerous secretory glands which account for the prominent mucosal folds of the magnum. These glands secrete the thick albumen protein around the ovum. The stimulus to secrete albumen may be mechanical, arising from passage of the ovum along the magnum. Smooth muscle contractions peristaltically move the ovum along the oviduct. In a sexually active bird, the magnum undergoes tremendous enlargement. Added length of the enlarged magnum causes a folding of the oviduct upon itself. This region of the oviduct is short and has less prominent mucosal folds than the magnum. The division between the magnum and the isthmus is marked by a thin translucent line which can be seen on the mucosal surface with the unaided eye in domestic fowl. The isthmus produces two shell membranes which are loosely secreted around the ovum and albumen. The uterus is initially a similar diameter as the isthmus, but rapidly expands to form a pouch which retains the egg during the entire remaining portion of egg formation. In the proximal uterus, “plumping” occurs, where the injection of water into developing egg fills out the size of the egg and allows for the development of the thin albumen layer closer to the shell membranes while the remaining thick albumen remains. The shell is developed in the more distal portion of the uterus. The short terminal portion of the oviduct immediately proximal to its junction with the urodeum is the vagina. Strong muscle of the vaginal wall and a well-developed muscular sphincter at the uterovaginal junction serve to expel the egg during oviposition.

Endocrine Control of Reproduction

In the female and the male, the hypothalamus plays a central controlling role in reproduction External factors as well as internal factors are responsible for development of hypothalamic and reproductive activity in birds. Light photoperiodism can play a role in many psittacine species, but not all. Light stimuli affect the hypothalamus directly via optic nerve transmission as well as indirectly through the skull and the pineal body. Additional stimuli which functional as signaling antecedents for activation of the hypothalamic-pituitary-gonadal axis include the perceived presence of a mate, perception of pair-bond reinforcing behaviors from the mate that may indicate interest in breeding, the perception of an available nesting site, and the ready availability of high caloric diets with minimal effort required to access them. Gonadotropin releasing hormone (GnRH) carries the activating signal to the anterior pituitary. The primary female gonadotropin is FSH which is responsible for follicular growth. Only small amounts of LH are required for normal follicular growth. As the follicles increase in size, they begin to produce increasing amounts of estrogen and progesterone. These hormones in turn influence the quantity of gonadotropins that are secreted by the anterior pituitary gland. Of these two hormones, progesterone is the most significant hormone regulating anterior pituitary activity. Serum concentration of progesterone seems to directly influence its role in an inhibitory or stimulatory role. Higher levels of progesterone inhibit the anterior pituitary gland and low levels stimulate it.

Progesterone acts mainly on LH, and LH is clearly involved with control of ovulation. LH peaks approximately 6-8 hours before ovulation. This results in increased progesterone secretion from the developing follicles. Increased progesterone levels pass the threshold from positive to negative feedback. This mechanism acts to prevent the development and ovulation of more than one follicle at one time.

After ovulation, the post-ovulatory follicle shrinks to an empty sack which rapidly regresses. There is no avian equivalent to the corpus luteum seen in mammals. Progesterone secretion decreases rapidly in the post-ovulatory follicle and is negligible after 24 hours. This helps to decrease progesterone to a low level which acts to positively feed back to the hypothalamus and increase LH secretion and promotes ovulation of the next mature follicle. Estrogens are involved in the induction of numerous female sex characteristics and behaviors. Estrogen probably works synergistically with other hormones such as progesterone and prolactin to initiate these activities as well. The role of testosterone in the female bird is poorly understood, but it is known to function to augment male reproductive behaviors.

THE ROLE OF ENVIRONMENTAL AND BEHAVIORAL STIMULI ON REPRODUCTIVE ENDOCRINOLOGY

Unlike many of the more common pet domestic mammal species, avian reproductive function is predominately initiated by *extrinsic or environmental stimuli*, as opposed to *intrinsic* cyclicity. Once the hypothalamic-pituitary-gonadal axis is activated, a predictable cascade of events and consequences can occur. These events include endocrine, physiological, behavioral, and anatomic changes and activities in birds. Even what has been described as signs of reproductive behavior (paper shredding, nest building, hiding under papers, and/or seeking dark places) are guided by activity of the pituitary-gonadal axis, and are not necessarily involved with the signaling of its activity. In this sense, nest-seeking behaviors are merely the result of an already activated pituitary-gonadal axis and are predictive of more direct reproductive activity in birds. In an ideal clinical preventative setting, striving to effectively control the signaling antecedents which function to activate the pituitary-gonadal axis should be most preventative, if not curative. In clinical settings with more advanced reproductively linked disorders, after the immediate clinical problem has been successfully addressed, efforts on a preventative level still are an essential part of complete medical care.

Most non-domestic avian species breed opportunistically and are reproductively active only when favorable environmental conditions exist. These are typically birds adapted to tropical or desert climates, and, if the climate allows, these birds may breed. In the absence of supportive environmental conditions, reproduction does not occur. Each year, the proportion of birds in a wild population that breed can be low, and some species breed only every other year or every few years. Parrots are mainly monogamous and, in the case of larger species at least, pair for life. The bond between pairs is constantly reinforced by a variety of behaviors, such as allopreening and feeding. This strategy is perhaps adaptive, because of the high proportion of learned (as compared to instinctive) behavior exhibited in parrots: pairs that know each other well and have experience of one another breed more successfully.

Environmental stimuli that can signal and stimulate reproductive activity, and ultimately lead to oviposition in avian species include photoperiod, temperature, rainfall, available food supply, the presence of nesting material, and/or the presence of a mate (real or perceived). The perceived photoperiod by birds is understood by many as a very important environmental cue for reproductive activity in the domestic fowl. Its role in parrot species is not as well studied as it is in the chicken. Rainfall is known to stimulate reproductive behavior in many tropical and desert-dwelling species of birds. Rainfall and temperature often directly affect the available food supply, which is another critical factor affecting reproductive activity. The presence of nesting sites and appropriate nesting materials is a powerful reproductive cue for many parrot species. Abnormal “mates” can include an owner or other human, some items within the cage, and toys. Another bird housed in the same cage, the same room, or even simply within hearing distance may signal activation of reproductive drive. In some species, classically the chicken, there is a genetic predisposition for chronic egg-laying and lack of normal reproductive hormonal balance. Pet chickens and waterfowl are common species representations of the genetic predisposition for chronic egg laying. Pair-bond enriching behaviors include regurgitative feeding, copulatory behaviors, nest site inspection and mutual preening are acknowledged as triggering cues for reproductive activity.

A SCALE FOR SELECTING AND PRIORITIZING PROFESSIONAL RECOMMENDATIONS

Medical intervention generally is guided along the ethical guidelines of "Least intrusive, most effective". A hierarchy of treatment options that progressively move up this scale, as indicated in specific cases is vastly important. Many of the more intrusive treatment options, when not preceded by some of the more foundational and less-invasive recommendations for excessive egg laying should be realistically predisposed to a higher degree of failure. Degrees of intrusiveness of a recommended treatment can be tested by the amount of induced stress, physical pain, and cost. In addition, treatments that require repeated administrations should be challenged for their compatibility with this hierarchy *in-toto*. Degrees of effectiveness can be tested by their short term and long-term effect at directly achieving their goal, as well as their effect at preventing recurrence in the future. Reduction of the probability of potential side effects and their adverse consequences on the health and welfare of the bird is also a very important test of effectiveness of a treatment.

Prevention

Many young parrots sold as pets are "mentored" and taught by their new owners only one form of social interactive skills (pair bond enrichment behaviors), as opposed to the typical array of social skills that would have been taught by the parents of their wild counterparts. Deficits in normal social interaction skills, foraging activities, learned inappropriate pair bonding behaviors, inappropriate diets, the provision of nesting environments and other factors are common. The first and foremost component of healthcare and prevention of excessive egg laying comes from the identification of existing risk factors at routine examination, client education, appropriate recommendations, and careful follow up on recommended actions with owners. Recommendations for enrichment of normal lifestyles, positive reinforcement training for guiding flock interactive behaviors, dietary recommendations, foraging training, and cage environment improvements all are essential foundational preventative maneuvers. In essence, enrichment of these types of behaviors is a key aspect of the routine annual examination.

Environmental and Behavioral Interventions

In the presence of excessive egg-laying in companion birds, a series of recommendations and training / enrichments should be outlined for bird owners. Specific recommendations are guided by signalment, history and physical examination findings. Although many of the needed recommendations require the "removal" of reproductively associated stimuli and behaviors, more ethical recommendations should also concurrently package and emphasize the training of normal behaviors to replace what is removed. The stress that can be generated by environmental and behavioral deprivation, although it can add to short-term "effectiveness", should be viewed as less ethical than a behavior-change strategy that is based on differential reinforcement of alternative behaviors. Environmental and behavioral deprivation can easily result in an increase in behavioral problems, ultimately adversely affecting the health and welfare of these patients. In most circumstances and when applied correctly, environmental, and behavioral interventions should be viewed as most ethical, least intrusive, and most effective treatments for uncomplicated chronic egg laying.

Environmental stimuli may need to be altered, and every recommendation should be carefully balanced with an enrichment or differential reinforcement plan for alternative behaviors. The photoperiod may need to be altered and reduced for some species. Nest sites, toys, and other items to which the bird has a sexual affinity should be removed from the enclosure. Access to a nesting environment (shredded papers, a box, or other dark cavities) should be prohibited. In the event that a pet bird is showing nesting behavior and laying eggs in a designated site within the cage environment, removal of eggs from the nest should be avoided for the normal incubation period for each species to discourage the hen from laying another clutch. Any perceived or actual mate should be removed from the cage or room environment. In some situations, and with some species such as the Cockatiel, visual and auditory separation from a "mate" may be necessary. A "one-person bird," with only a single household member who exclusively handles and cares for the bird should be potentially viewed as an established “mate relationship”, which may serve as a trigger for reproductively driven behaviors and activities. Stimulatory petting by the owner, such as rubbing the pelvis, dorsum, and cloacal regions should be stopped. “Flock” interactive behaviors should be encouraged in preference to one person or “mate” interactions in the home. The cage location and internal set up (perches, toys, etc.) should be changed and rotated periodically to provide a “new or changing” environment that is less stable and less reproductively stimulating. Inappropriate nutrition that is identified should be corrected to improve the hen’s dietary plane to decrease the severity of metabolic drain. Dietary alteration with a reduction of caloric intake appears to significantly reduce or stop egg production with many companion parrot species, as well as enable training and behavior-change strategies.

Medical Therapy

Medical therapies for chronic egg-laying tend to focus on drug therapies to reduce or stop egg production. Pharmacologic options have included medroxyprogesterone acetate, levonorgestrel, human chorionic gonadotropin, norethindrone-mestranol, testosterone, leuprolide acetate (Lupron®) and deslorelin. With the exceptions of leuprolide and deslorelin, most of these drug or hormonal therapies have variable effectiveness and significant adverse side effects. Both drugs are synthetic GnRH agonists, which have a long half-life and reportedly higher affinity for GnRH receptors compared with endogenous GnRH in mammals. These agonists initially stimulate secretion of LH and FSH from the pituitary gland, and ultimately suppress continued release by negative feedback mechanisms.

Leuprolide acetate depot is a synthetic, GnRH agonist available as a depot formulation. In birds, it is used most commonly for treatment of excessive egg laying or other reproductive hormonally mediated problems, and to decrease undesired associated problem behaviors. There are few controlled clinical trials that exist which examine the efficacy of this drug. Leuprolide acetate reversibly prevented egg laying in cockatiels after a single intramuscular injection 100 µg/kg (12-19 day delay in egg laying compared with a control group). Racing pigeons (*Columbia livia domestica*) administered 500 and 1000µg/kg IM of leuprolide acetate had no alterations in plasma sex hormones nor egg production. A single injection of leuprolide acetate administered to nonbreeding adult Hispaniolan Amazon parrots (*Amazona ventralis*) at a dose of 800 µg/kg IM reduced plasma sex hormone levels for less than 21 days. For clinical uses, the recommended dose range is wide, from 100 to 1200µg/kg IM every 2-3 weeks. These types of treatments may be financially unfeasible for some clients, as long-term and repeated treatments are usually required. Anecdotally, the efficacy of leuprolide acetate decreases after long-term repeated administration. There is one report of a suspected anaphylactic reaction and death in two elf owls. Although leuprolide acetate appears to be a safe form of treatment, the product is expensive, requires repeated use, and does not alone correct the causative cascade of reproductive activity in the female bird. Additionally, because leuprolide and deslorelin can in fact often have a suppressing effect on sex steroid production, their use can effectively reduce observable behaviors that would be necessary to observe to establish a longer-term behavior-change strategy. This in turn, sets the stage for a recurrent cycle of treatment, as opposed to a longer-term behavior-change strategy.

Deslorelin acetate is formulated into a subcutaneous, controlled-release implant, and comes in 4.7mg or 9.4mg sizes. In the United States, deslorelin implants are approved only for use in ferrets for the treatment of adrenal cortical disease. These implants come in preloaded needles with a separate applicator syringe, similar to a microchip, and are used in birds to decrease reproductively associated problem behaviors, reproductive disease and egg laying. The implantation procedure typically requires either deep sedation or general anesthesia, particularly for smaller bird species. The recommended implantation site is subcutaneously in the mid-scapular region, although in budgerigars the skin in the region of the knee fold can be used. The most common side effect of implant placement is treatment failure. In chickens, a 4.7mg implant reduced egg production for a mean of 180 days, and a 9.4mg implant inhibited egg production for 319 days. In Japanese quail, the 4.7mg implant reversibly decreased egg production in 6 out 10 birds for 70 days, and 17β-estradiol and androstenedione were significantly lower in the treatment than in the control group on day 29, but at no other time points. The 4.7mg implant decreased egg production, plasma corticosterone, and 17β-estradiol concentrations in 89% of the birds for 7-18 weeks, with 55% of the female quail effects > 14 weeks, and 70% of male quail effects > 9 weeks. In pigeons, the 4.7mg implant reduced egg production for 5-7 weeks and reduced serum LH concentrations for 84 days compared with control birds. There appears to be substantial interspecies variation, as well as individual variation in birds treated with deslorelin, which poses challenges with selecting dosage interval for treatment for a particular individual. Typically, observed return of reproductively associated behaviors and/or egg laying are the most common problems that are used to signal the need for retreatment. Measurements of reproductive hormone levels have been highly variable and do not necessarily reflect the reproductive status of the bird. In one non-peer reviewed literature report reviewing the outcomes of 4.7mg deslorelin acetate implants in 96 psittacine patients, the interval between implants for that group of birds was 3 months (2-5 months). Thirty-two of those birds were females that received a single 4.7mg deslorelin implant to prevent chronic egg laying. When combined with behavioral and environmental modifications, treatment with repeated implantation of a single 4.7mg deslorelin implant over a period of 6-9 months lead to a successful resolution of chronic egg laying. There are anecdotal descriptions of decreased efficacy over time after repeated administrations. As with leuprolide, use can effectively reduce observable behaviors that would be necessary to observe to establish a longer-term behavior-change strategy. This, like Lupron, sets the stage for a recurrent cycle of treatment, as opposed to a longer-term behavior-change strategy.

Surgical intervention

Surgical salpingohysterectomy or endoscopic salpingohysterectomy may be indicated in specific patients that are plagued with chronic egg laying problems. Ethically, this option should be pursued only if environmental, behavioral and/or medical therapy has not been successful, the relative risk to the overall health and welfare of the bird is gauged to be significant, and if there is no intent to breed the hen. Surgical treatments carry the greatest cost at their outlay, require advanced training in avian soft tissue surgery or endosurgery, and carry the greatest immediate risk of procedural complications and death. Salpingohysterectomized birds still retain their ovary, and hence may still be predisposed to estrogenic behaviors, hyperestrogenism, cystic ovarian disease, internal ovulation, and egg yolk peritonitis.

BEHAVIORAL SCIENCE AND ITS APPLICATIONS TO THE MANAGEMENT OF REPRODUCTIVE HORMONALLY ASSOCIATED PROBLEMS

GnRH agonists, to a somewhat variable level, do work to suppress reproductively-associated endocrine mediated problems – but only temporarily to varying degrees. They both require repeat treatments and carry cost. Because they suppress reproductively associated behaviors which are augmented by sex steroid hormones, the acuity of any targeted form of behavior change strategy should be expected to be blunted. It is hard to work to change behavior that you cannot see. In addition, the repeated use of these drugs typically generates revenues and short term client satisfaction, in turn, reinforcing their continued use, but not necessarily leading to the indicated longer term behavior changes that may be most optimal.

The simplest manner of describing and initial evaluation of a behavior is through the use of the ABC's of behavior. The letters stand for the three elements of a simplified behavioral "equation" which includes the *Antecedents*, *Behavior*, and *Consequences.* With this simple descriptive and analytic strategy, we seek to identify through careful observation the events and conditions that occur before a specific behavior − *Antecedents*, as well as identifying the results that follow the *Behavior - Consequence*s. When paired with keen observation skills and creative problem-solving abilities, the ABC's will help us clarify the way in which the basic components of behavior are interrelated. It is this clarity that leads us to important insights and more effective teaching or training strategies. The ABC's can also help us identify problem situations and consequences that have a formative role in some behaviors too. There are six steps to analyzing the ABCs: (1) describe the target behavior in clear and observable terms; (2) describe the antecedent events that occur and conditions that exist immediately before the behavior happens; (3) describe the consequences that immediately follow the behavior; (4) examine the antecedents, the behavior and the consequence in sequence; (5) devise new antecedents and/or consequences to teach new behaviors or change existing ones; (6) evaluate the outcome. A careful distinction needs to be made between *behaviors* and *constructs*. In this context, a behavior describes *what* a bird is doing and is defined as something that can be observed and measured. Alternatively, a construct is an idea or theory about the mental processes inside an individual that explains *why* or *how* they behave as they do. A construct cannot be observed or measured directly. For example, a parrot may be presented with a complaint of being showing reproductively associated behaviors and may be easily labeled as "hormonal". This construct can be thrown in quite easily, however, often setting the stage for protocols for treatment and course of action that are less than ideally balanced to the needs of the bird at the time. The distinction between behaviors and constructs is part of a larger framework for understanding behavior that is relevant to a specific situation. Not all reproductively associated behaviors are driven by sex steroid hormones, and all are, at the end of the day, behaviors. At the most, sex steroids may function as an antecedent in the broad framework of the description of and formulation of a patient-specific behavior change strategy. By describing a behavior in the context that it is occurring, one is more optimally positioned to describe problem behavioral situations – and more opportunity to alter them.

Fundamental Laws of Behavior and Their Applications

An excellent exposure to Applied Behavior Analysis can be seen and reviewed at behavior.org and behaviorworks.org. The functional definitions of reinforcement and punishment are displayed below in table 1. Any behavior that is being increased is, by definition, being reinforced. Conversely, a behavior that is being decreased, is being punished. Both changes in the frequency of a specific behavior can be influenced by the introduction of a stimulus, or the removal of one. Contrary to the way our minds would want to think, Reinforcement is not necessarily a good thing, and Punishment is not necessarily a bad thing. It all depends on context and details.

Table 1. The Basic Paradigms of Reinforcement and Punishment

	Operant Response Increases	Operant Response Decreases
Stimulus Presentation	Positive Reinforcement (R+)	Positive Punishment (P+)
Stimulus Removal	Negative Reinforcement (R-)	Negative Punishment (P-)

Reading from the left, if a stimulus is being presented to the animal because of the operant response (behavior), we are dealing with a POSITIVE. Then, evaluating the frequency or probable frequency of the operant response, we can assess if the stimulus is functioning as a positive reinforcer (R+), or a positive punisher (P+). If the behavior increases, the introduced stimulus is a reinforcer, and if the behavior decreases, your introduced stimulus is a punisher. If a stimulus is being removed from the animal, we are dealing with a NEGATIVE. Based on the observed frequency or probable frequency of the behavioral consequence of this removed stimulus, we can also assess if the stimulus is functioning as a negative reinforcer (R-), or a negative punisher (P-).

Ethically, when we examine these Reinforcement and Punishment modalities as sole behavior change strategies, positive reinforcement would be least-intrusive and more ethical as opposed to positive punishment, which would be most-intrusive and less ethical. (Generally speaking, of course). There are specific reasons why punishment alone is not a preferred behavior-change strategy. Frequent punishment increases the probability of four side effects detrimental to the quality of life of all animals. These side effects include aggression, apathy, generalized fear, and escape/avoidance behaviors. Unfortunately, these side effects are commonly seen among captive parrots. These observations could lead us to consider if they could represent a failure, collectively, on our parts to train or teach with more truly effective methods. There are almost always positive reinforcement alternatives to punishment.

Applications of Skinner’s paradigms to reproductive hormonally associated problems: It Looks Different from Different Perspectives

GnRH agonist use, presuming that sex steroids are a signaling antecedent for reproductively associated behaviors, function as an antecedent arrangement strategy. Lacking in the behavior change paradigms are consequences (stimulus presentation or removal) of the target behavior that could be used strategically to decrease the behavior(s) as may fit in Skinner’s paradigms above. Although effective, in the absence of this manner to formulate a strategy employing positive reinforcement of incompatible or alternative behaviors, often paired with negative punishment of the target behaviors, this antecedent arrangement strategy alone is incomplete. Common additional antecedent arrangement strategies recommended include removal of perceived nesting sites, reducing or eliminating physical contact between owner and bird below the head, dietary change recommendations (decrease of total calorie consumption). Details of the implementation these strategies, although they do hold some basic general similarities, should be expected to vary amongst species, individual birds, and owners/stewards. To compliment these antecedent arrangement strategies, behavior change must also be implemented. In principle, should behavior change be effective, and when paired with tailored antecedent arrangements, the continual need for GnRH agonist treatments may be able to be reduced if not outright avoided. Only by integrating the specific use of positive reinforcement consequences can alternative behaviors be encouraged, which if planned well, can serve to help downregulate the HPG axis. From the client’s perspective, and to reinforce continued return visits, these positive reinforcers should target a client’s knowledge of how to improve their bird’s relationship with them and that visibly improve the quality of life for the bird in their home. Should the client’s perception of these appetitive consequences be indeed favorable, their willingness to return will be reinforced. The strategy in achieving this perception lies in their selection of target behaviors that will help serve a downregulation of the HPG axis, that can be accomplished by the owner (serial visits and training sessions may be required), and that are perceived as valuable / enjoyable by the owner. Regular use of GnRH agonists, should these drugs suppress observable behaviors, will inhibit the practice and client’s ability to assess reproductively associated behaviors and the addition of alternative behaviors into the bigger scheme of management goals will be rendered much more generic and less effective, as those observable behaviors will have been suppressed pharmacologically alone (antecedent arrangement). As a result, regular, periodic treatments with GnRH agonists will most likely persist.

From a practice management goal, where return visits that generate revenue is the target client behavior desired, Skinner’s paradigms can provide a different point of view to the picture. Negative punishing potential consequences for client return visits can include the inconvenience of the trip to the office and loss of time, and cost. Positive punishment potential consequences may include the client’s perception of rude behaviors by the staff at the hospital, their perception of inappropriate handling and restraint techniques, or their perception of induction of painful experiences for their bird, which may be related to the procedure or physical injuries as a result of handling and restraint itself. Negative reinforcements of client return visits can include their perception that the treatment(s) are resulting in a reduction of reproductively associated behaviors or problems (removal of an aversive stimulus). Positive reinforcing consequences from the practice management perspective include the revenues generated, and the staff perception of a pleased client (quality service delivered).

Consequences of client return visits can be in direct conflict, when comparing these practice management and client perceptions. Costs incurred and deposited as a result of the visit positively reinforce the practice management perspective of desired client return visits, but may function as a negative punishment from the client’s perspective. The potency of this negative consequence may be reduced by lowered costs, discounts, etc., but their presence will remain. Should doctors be compensated as a percentage of gross revenues generated, there also is a potential positive reinforcement for them (increased pay earned) by higher costs that can be charged, which can potentially conflict with the client (negative punishment). Should the client’s perception of value (negative reinforcement – alleviation of observable behaviors or perceived risk of disease) be great enough, their return visits can still be overriding the potential negative punishments inherent with their visit. It is the awareness of these different conflicting paradigms at play that can help veterinarians shape the soundest practice management, client, and patient service strategies.

CONCLUSIONS

Reproductively associated behaviors are common. Their linked medical problems can be successfully addressed, most effectively, least intrusively by applying an ethical hierarchy to treatment recommendations. Behavioral and environmental changes are essential and often are effective when applied in a first-line approach. Medical treatment options and surgery can be intrusive and will still require behavioral and environmental changes to be most effective. Used alone, or with minimal focused behavior change strategies, GnRH agonist use as a sole form of treatment lack these targeted behavioral interventions and can be suboptimal or incomplete in their applications. By incorporating good behavioral medical components into the short term and longer-term treatment strategies, an optimal, patient and client specific course of treatment can be implemented, while concurrently reinforcing short term and longer-term practice management goals.

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