A Comprehensive Plan for Managing flock Reproductive Performance

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Study principles rather than methods. A mind that grasps principles can devise its own methods ..... " B. Gill

Introduction

Evaluating reproductive performance as a component of a complete flock health program is rarely utilized in current avicultural medicine. A flock health program does not base itself on the use of the more common approaches to providing medical care for populations of birds such as attempting to diagnose and treat clinical disease when it is encountered, (crisis oriented medicine). Through the use of record review and proper flock management, subclinical disease is identified and subsequently resolved. Through this type of a more comprehensive approach, aviculture is capable ol⁼ truly managing populations of non-domestic bird species and their reproductive productivity. The processes necessary for the effective design, implementation and subsequent evaluation of a flock health program are discussed step by step in an effort to promote this relatively new area of avicultural medicine. Without a uniform understanding of the rationale, end stage goals-and methods of a true flock health program, veterinarians and aviculturists are more likely to fail in their efforts to optimally manage the reproductive performance of non-domestic bird populations.

Introduction

For the last decade, avian veterinarians have made significant advances in the art and science of diagnosing and treating a large variety of bird diseases. Furthermore, there is little doubt that continued research, as well as published clinical experiences will lead to new and exciting discoveries in the broad field of avian medicine and surgery. The purpose of this paper is to introduce record review, a relatively new and seldom used diagnostic tool or avian reproductive medicine, as a portion or a flock health program (FHP). It is our hope that its value as a means of identifying subclinical reproductive disease or performance deficits in non-domestic bird flocks will be apparent to any veterinarian providing medical care for any bird species. Perhaps to even a greater

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degree, the authors firmly believe that a firm grasp of these principles by the private avicultural sector and sincere desire to continue to manage bird populations in a better and more efficient manner will lead to an increased development and documentation of optimal flock health management programs in the future.

A flock health program (FHP)is, in this setting, a comprehensive approach to managing a population of non domestic birds: Components of this program include the business mission statement, record review, aviary and traffic flow maps, business and financial analysis, and an integrated team approach towards attaining preestablished short term and long term goals. Individual avian reproductive diseases, their diagnosis and treatments are not included in the scope of this paper. It is our belief that through implementation of an appropriate FHP, reproductive management of bird flocks has the potential to advance beyond crisis intervention modalities that predominate in most current avian medical and avicultural circles. Record review is the key tool that will allow for early detection of substandard or abnormal flock performance patterns and help establish appropriate corrective action.

Herd health management concepts are being routinely utilized in food animal production, but a standardized approach to a FHP does not currently exist for non-domestic avian species. The avian flock, for all extents and purposes, remains the "neglected child" of current avian medical practice. Furthermore, the possibility of developing their collections to become more comprehensively managed and reproductively efficient through the development and implementation of a Flock Health Program remains a relatively foreign concept in most private avicultural circles.

Aviculture is a historical and significant reality of man and birds, and unfortunately, comprehensive veterinary and private ownership interaction in planning and attaining reproductive efficiency still is comparatively rare. In the past, there has been more of a complete veterinary relationship with aviculture in some conservation efforts than in private collections. Over the last century, captive propagation has supported the status of some rare birds in the wild. When aviculture is utilized in conjunction with other sound wildlife management techniques, conservation efforts for some avian species can potentially be quite successful. Programs involving the whooping crane, nene goose, St. Vincent Amazon, St. Lucia Amazon, peregrine falcon and California condors are all good examples of successful avicultural propagation in their respective conservation efforts. Many of these efforts succeeded, or are currently succeeding, in part, due to veterinary, scientific, and avicultural cooperative efforts in their respective captive breeding programs.

In the private sector of aviculture, the paucity of comprehensive veterinary and aviculturist interaction is particularly striking. Currently, flock management or therapy recommendations predominately originate from individual bird diagnoses as presented to private practicing veterinarians (crisis intervention) rather than originating from a proactive managerial point. Epidemics of infectious disease, individual bird diagnostics and preventative treatments for flocks with known infectious disease outbreaks

predominate in the avian medical literature, rather than the identification of subclinical performance deficits and improving reproductive efficiency for the flock. Animosity and poor working relations are not uncommon between aviculturists and private practicing veterinarians, and most individual avicultural "success" is attained primarily by the aviculturist's overall flock managerial elfotis alone. The origins of these poor working conditions, in these author's opinion, lie in an incomplete approach to truly managing these flocks - an absence of a successfully implemented FHP.

It is our belief that a well organized and implemented FHP is essential for the continued maturation o1" modern aviculture, and it is mandatory that this program utilizes well thought out and applied veterinary knowledge as well as seasoned avicultural experience. Veterinary input required to develop a successful FHP is above and beyond the traditional skills utilized in the private practice sector. A complete FHP requires a balance of traditional veterinary medical knowledge (pathogen and disease biology, diagnostics and treatment) and non-traditional veterinary skills (epidemiology, genetics, business proficiency and in some cases, field biology and species conservation efforts).

Although it may not be readily apparent, almost every veterinarian who sees birds in private practice regularly has the potential to develop and implement a FlIP for their their clients. Reciprocally, most aviculturists have the potential to generate a FHP to serve their needs and goals better and improve their flock's reproductive performance. In general, flock management has the primary purpose of increasing production through improved reproductive efficiency. For most aviculturists, this translates into more viable and saleable chicks produced. Poorly designed and implemented FHP's can potentially damage both the aviculturist and the veterinarian emotionally and monetarily. Obtaining results, in this case improved reproductive performance, is an immensely impodant goal to attain.

In aviaries with an already established FHP, veterinarians serve as essential "team members" and work to improve production. Veterinary roles change from one specifically for the purpose of identifying and treating "disease" in individual birds, as is classically and traditionally recognized, to an added one of improving the overall health of a "new "patient - the flock. The FHP is not a "fixed" or "preset" entity, but is a continuously evolving and growing plan for improved flock production management.

Understanding the true patient

With flock or herd health medicine, the "patient" has been changed from the individual (single bird) to the collective group (flock or aviary). In other words, the aviary is the *primary* patient and the individual birds housed therein are viewed as pads of the the aviary's makeup. As such, the individual bird's pedormance or disease processes diagnosed can have an influencing impact on flock managerial intervention. For definition purposes, the following are used in the author's practice, and viewing these definitions, we feel that most avian veterinarians have the client base to potentially offer FHP services:

1. "Flock" is used to denote any collection of more than one bird in the same location.

2. "Breeding Flock" is any flock with at least one pair stated by owner as having reproductive performance their intended goal.

3. "Aviary" is the structural location where a "flock" or "breeding flock" is housed, and includes the owner of the birds as a pad of its definition.

The aviary is composed of far more than individual birds. Instead seeking initially to diagnose infectious disease as the cause of infertility in a non producing pair of macaws, the flock- oriented veterinarian and aviculturist will be more effective if they first understand the overall health of the aviary and the relative significance or that pair's reproductive inefficiencies. The specific problem pedinent to the macaws can then be diagnosed more rapidly, efficiently and at less net cost. Timing as to when it may be most beneficial for investigation into the problem will be more clear. Diagnostic "samples" from the aviary may include any or all of the following: flock production records, structural and traffic flow diagrams, financial information and individual diagnoses previously established in the aviary's birds themselves, video monitoring of the bird's behavior in the flights, utilizing medical records including itemized clinical or tentative diagnoses and pathology repods.

The Closed Aviary Concept

The Closed Aviary Concept serves as perhaps the single most unifying theme in progressive psittacine aviculture. In the conceptually closed aviary, both clinical and subclinical disease are controlled and monitored through adherence to the basic principles of designated areas and controlled flow of human, animal and fomite traffic. This concept of traffic control is used to reduce avicultural variables during or resulting from movements within designated areas of the aviary as well as within the aviary as a whole. Minimized variables lead to reduced problems and maximizes the potential for attaining production goals.

Following the basic guidelines of the closed aviary concept is an absolute requirement for the successful implementation of a FHP. Without closed aviary management, the FHP is violated, making disease incidence a random and unpredictable event. Open facilities without coherence to closed aviary principles are realistically managed on a crisis intervention basis only, which fundamentally prohibits planned reproductive flock management. If unfamiliar with this subject, the reader is strongly encouraged to review the closed aviary concept before attempting to begin a FHP (Speer, reference #3).

Taking the initial steps

It is important that the flock orientated veterinarian have a structured plan when

approaching the aviculturist. After identifying the client and patient, the veterinarian has to collect some initial information. The avian veterinarian first obtains the aviculturist's m'ission statement which is a written or verbally stated set of customized goals. Additional information that is evaluated and interpreted with the mission statement in mind includes production records, aviary map and traffic flow, key expenditures, production goals and income. The basic information collected above helps mold the FHP, evaluate and identify reproductive disorders and make the aviculturisFs goals a potential reality.

Mission Statement

The mission statement guides the FHP and should be realistic, concise and truly representative of the aviculturist’s aspirations and ethical opinions pertinent to their aviary. This statement comprises the "vital concepts" from which your client has become an aviculturist. We encourage that practitioners share their own practice mission statement with their clients as an example.

The aviculturist's mission statement should include:

1. who the client is
2. what the client is (i.e. what type of business or aviary)
3. what the cfient wishes to accomplish and
4. how the client wishes to achieve his or her goals.

Keep in mind that these goals can be emotional, financial,. pleasure (i.e. hobby), conservational or a combination of any of the above. For example, an aviculturist raising and selling budgerigars may wish to sell a large volume of low cost birds as a hobby. This aviary will be managed differently from one in which budgerigars are bred and sold in low volume and higher quality and cost. Therefore, the attending flock veterinarian needs to base managerial and medical decisions, recommendations and considerations on their client's mission statement. As the aviary grows and changes, so may the mission statement and so must the FHP.

Aviary Map

The aviary map should include an accurate account of the structural layout of the aviary such as breeding buildings, quarantine facilities, nurseries, physical barriers, feed locations, location of birds and species and any of the other aviary components. Aviary maps demonstrate the anatomic features of the facility. These maps may vary from a basic layout of someone's home or backyard facilities up to a large multi-species aviary.

Traffic Flow Map

Using the aviary map, traffic flow is carefully evaluated. The flock oriented veterinarian should ask their client to draw their daily movement including feeding,

cleaning, handling and other routine activity directly on a copy of the map. We call this the 'spaghetti test' for obvious reasons. Those aviculturists who are inattentive to traffic flow will show areas of high traffic flow, demonstrated by increased concentrations of parallel lines suggesting potential fomite transmission, ineffective human traffic flow, wasted time and effort and poor structural design. The traffic flow and aviary map must be kept updated with the client's file, and serves as a diagnostic, crisis intervention and business management tool.

Financial Information

Evaluating finances is probably the least comfortable for both the veterinarian and the client, but are vital to the FHP especially if there are any monetary limitations or concerns. Consulting veterinarians must have a solid foundation in basic business management. Perhaps more importantly, the financially dependent aviculturist must accept their flock as a business endeavor. As with other farming industries, aviculture birds work for the owner and provide the income, pleasure or other goals established in the mission statement. A thorough financial review goes beyond the scope of this paper and will be described in future discussions by these authors.

Production Records

As an integral diagnostic test to evaluate the health of the aviary, the flock oriented veterinarian should review and begin to analyze the production records from the facility. For many private aviculturists, record keeping is generally a foreign concept and is considered a laborious task with no real perceived benefit. For those without a record system, establishing one becomes one of the consulting veterinarian's first duties. This same philosophical approach is also new ground for many avian veterinarians, but it is only through record review that subclinical disease and production are truly evaluated. These benefits of record keeping and review should be identified for the aviculturist.

For those aviculturists who have maintained records, their veterinarian can review past disease incidences and problems, develop an understanding of the aviculturist's record taking and keeping abilities and possibly begin to diagnose clinical and subclinical diseases within the patient - the flock, Reviewing records will be a monitoring and motivational tool and will become increasingly important as the aviculturist-veterinarian team develops their FHP.

Although ratite flock management will probably require additional emphasis on meat production and animal by-products. Most aviculturists are interested in successful reproductive management and saleable chicks which is the focus ot this discussion. Records can be divided into four main areas including general information, adults, pediatrics and incubation. Factors including the aviculturist's mission statement, record taking abilities and attention to detail determine the volume of information entered and thus serve as a variable diagnostic tool for the veterinarian.

General records include all the information pertinent to the aviary, including the bird's diets. The date of construction, materials used, ventilation systems, additional modifications, cleaning and maintenance protocols and nutritional information are recorded in this category. Details can be highly variable but should include basic construction materials (walls, floor, counter tops, cages, nest boxes, etc), cleaning chemicals used, air flow and food types for all birds in the aviary. This material is kept current with the aviary map to provide an internal and external view of the facility.

Adult records include the bird's past and present histories. The aviculturist may include where and when the bird was acquired, known parents, sex and how and who determined the sex, previous owners, and breeding history including reproductive performance, current and/or past mate(s). Breeding pair information may include nesting period, eggs during each breeding season, disposition of the eggs (fertile, infertile and dead-in-shell), live chicks and number of male and female young. Review of these records, single and compounded will give reproductive production information for both the individual birds and the flock respectively.

Chick records are perhaps the most dynamic and time consuming records to keep, maintain and analyze. The aviculturist may record parentage, date of hatch, daily or periodic weights, date eyes opened, age banded, identification, size of band, peak weight and age at peak, weaning food started, perching, fledging, and weaning dates, sex determination method and results and any medical disorders encountered or therapies administered. Obviously, most facilities do not have the man power or the time to record all of the above listed information, but the chick records give vital clues as to pediatric management. Remember, for most aviculturists and their attending veterinarians, increasing numbers of saleable chicks is the main production goal.

Finally, incubation journals are recorded for all incubated eggs. These may include incubator used, incubation temperature and humidity parameters, turning rate and degree, date egg was laid, date egg was set, expected and actual hatch dates, hatch intervals within the clutch, hatching observations, chick weight at hatch, egg candling observations such as fertility, vascularity, dead-in-shell (early, mid and late embryonic mortality) and all diagnostics performed. The data obtained from these incubation records relates to both parental reproductive and systemic health and incubation management.

When analyzing production records, the above listed information can be compounded in a variety of ways to help analyze the patient (the flock) and it's individual components (including the birds). Compounding information from birds of the same species, birds from certain locations within the aviary and all birds together allow the consulting veterinarian and aviculturist to quickly compare production between species, potential problem locations within the aviary and identify fertility and chick mortality issues. When comparing yearly values, the veterinarian can evaluate changes in the total aviary production, identify poor producing pairs or groups, and begin to work with the aviculturist to effectively manage the flock with the long-term goals in mind as defined

in the mission statement. Until more information regarding statistical analysis of flock production values is available in the literature, the authors recommend that veterinarians using the production records and their analytical data on a comparison basis between clients with similar variables within their flocks.This type of comparison can also serve as a motivational tool, helping the veterinarian to give the aviculturist evidence or changes (ideally, increased production and goal attainment) within their flocks.

Production Evaluation and Short Term Goals

Once the mission statement, records, aviary structural and traffic flow maps are gathered, aviary production is evaluated and shod term goals can then be established for the upcoming season. Veterinary evaluation and appropriate action (with the intent to increase productivity) may include infectious disease problems, nutritional issues, culling reproductive inefficiencies, establishment of a bird replacement program, a marketing plan for progeny, and a vaccination program. The shod term goals will address the immediate needs and disorders identified within the patient. Oftentimes, it is one or a combination of the above issues that initially brings the client in for veterinary assistance in a private practice setting.

Infectious Disease Problems

Infectious disease problems are often perceived to be the single most important issue for clients and may be overemphasized by many veterinarians. Veterinarians are easily tempted to address the pathogen without understanding the pathogenesis especially when a panic struck client or aviculturist presents a sick or dead bird from their aviary and requests what needs to be done for the flock. The classic example is treating a flock of cockatiels with chlortetracycline in the food for 45 days after diagnosing Chlamydiosis in a single bird without ever examining the true patient being treated (the aviary). Consequently, an aviculturist may spend money treating undiagnosed flock disease, possibly further concealing sub-clinical disease and still never properly assess the flock managerial picture for the flock. As a result, production management is simply being driven by therapeutic protocols to treat perceived infectious disease threat. This is why it is imperative for veterinarians to properly define their patient, evaluate closed aviary principles and collect the above listed initial information before instituting treatment. Infectious disease outbreaks can be the "window of opportunity" for consulting veterinarians and aviculturists to broach the subject and potentially initiate a FHP and assess and ultimately manage production.

In the circumstance of an outbreak of infectious disease in a collection or flock, the problem is obviously addressed, but past viral, bacterial/chlamydial, fungal and protozoal/parasitic diseases as well as non-infectious diseases should not be ignored. Documented productivity of the aviary will serve as a gauge with which to measure the impact of disease control measures on ultimate production goal attainment. Production records are reviewed for diseases and disease patterns providing more information for

the patient's "medical chart" (the flock). Short term goals include identification of production losses due to infectious disease, assessing the overall impact of disease on the aviary and ameliorating the patient's health with appropriate medical and/or managerial action which should be in accordance with the mission statement and the aviary's finances.

Nutritional Issues

In both avian and exotic animal medicine, and realistically in most aspects of production-oriented medicine, nutritional disorders are extremely common and represent another area veterinarians are often approached for assistance. Most commonly, however, assistance is requested when there are clearly identifiable losses occurring to *Clinical Nutritional Disease,* rather than subclinical performance deficits occurring in the flock. As a result, nutritional managerial changes and recommendations are being primarily driven by modality or clinical disease issues (reactive changes), rather than by management efforts of sub optimal performance issues (proactive changes). Careful evaluation of the avian diet in conjunction with the bird's past medical histories, however is extremely important. Obviously, clinical nutritional disease must be identified and eliminated from a Hock in order to allow subclinical disease to be sought out, identified, and addressed. For example, an aviary with lovebirds on a seed-only diet may have numerous cases of egg bound hens over the past several years, and may also have a pediatric record suggesting rickets- or calcium-related nutritional disease in chicks. After a review of the aviary's initial information, an avicultural veterinarian may discover relatively high medical bills (treating egg binding and other reproductive tract disease as well as pediatric orthopedic problems) and low egg production with decreased saleable chicks resulting. There may well be no historical evidence or infectious disease problems and good closed aviary rules may be being followed. The adopted short term goals may include improving the diet with a longer term anticipated result being lower medical care costs and more saleable chicks. An aviculturist who feels that a seed diet is more economical can easily be shown the merit of a dietary change and resultant increased production with reduced veterinary expenses. An absence of net gain experienced by a high veterinary expense management protocol (treatment of nutritional disease alone) with no overall managerial changes or evaluation is, in many respects doomed to failure. Anticipated results would include a conclusion by the aviculturist that veterinarians are costly and do not really impact net profitability, or a veterinary conclusion that aviculturists are "tight" and never really want to address the whole picture for their flock. Neither of these conclusions is fair or appropriate viewing the approaches forwarded in this paper.

Proper nutritional evaluation requires a cedain degree of avian medical and nutritional expertise as each species have different nutritional requirements that can vary according to breeding status, time of year and individuality. For example, rose-breasted cockatoos may develop obesity if allowed to eat a primarily seed diet or if not offered adequate exercise potential in their housing, while Hyacinth macaws often require a relatively high dietary fat content. As more avian nutritional studies are reported, this area will

certainly become better defined, and maintained in perspective through regular flock performance evaluation with established Flock Health Programs.

Culling Reproductive Inefficiencies

Before considering "culling" a bird or pair of birds, there should be effort expended to identify poorly producing pairs using the FHP (record review) and then either a decision to diagnose and treat the problem, diagnose and accept the disorder and it's impact, or cull and/or replace the bird(s). The idea of culling a psittacine species sounds harsh to many companion animal oriented veterinarians, but may very well be necessary for the execution of a good FHP. Obviously, "culling" does not necessarily mean killing - as all species are not culled similarly. When a poorly producing pair is recognized (through record review), first consider the etiology of their performance deficits, including mismatched birds (incompatible pairs, same sex, different species), sexually immature birds, reproductive inexperience, reproductive tract disease, environmental complications (weather, predators, neighboring birds or other stressors), nutritional disorders or other underlying disease processes.

If, after reviewing the records, the problem cannot be easily determined, consider diagnostics including laparoscopy, DNA sexing, medical workups or video surveillance or the birds. If diagnostics are prohibitive, inconclusive or identify a serious medical problem, the bird should be retired and perhaps moved to another location, accepted as a poor producer and kept in the same site or entered into the pet bird market. Depending on the species and situation, euthanasia may also be considered. An Emu producer and attending veterinarian must decide if diagnosing and treating a production problem such as persistent misshapen infertile eggs from a single hen affects the farm's overall production, and must then rationalize medical costs vs perceived benefits for diagnostics and treatment of that bird. It must be considered if those costs in a currently non-productive bird are appropriate, justifies the feed bills and other regular expense liabilities associated with this non-producing hen rationalize further expense at all.

Initiation of a Replacement Program

When considering adding new or replacement birds to the flock, the closed aviary "laws" are adhered to strictly. Birds are introduced into the flock with a purpose and must be selected accordingly. For example, a cockatoo aviculturist is interested in pairing a female Moluccan cockatoo with a new male, This aviculturist should ascertain if the "male" has a past history of "spousal abuse" in addition to a clean bill of health and proven sex status before purchasing the bird. Other desirable traits may include color variation, fecundity, parental instincts, and with ratires, meat quality and quantity, size, growth rate, reed conversion efficiency and production history of the genetic lineage. In conjunction with closed aviary principles, all birds enter the flock after passing a set of previously specified medical and physical criteria.

Marketing Plan

For most aviculturists, sale of birds is the main goal and lifeline of the operation. Although some aviaries are known by "word of mouth", most aviculturists should have a budgeted marketing plan. Consider helping aviculturists by offering creative external and internal marketing ideas such as flyers, magazine ads, talking to local bird clubs, post-purchase follow up calls and letters to buyers and sponsoring seminars for clients on popular avian topics. Advertisements should be included into the expense calculations of the FHP. For those aviaries already marketing their birds, critical evaluation of cost and, if possible, identification of excessive and ineffective strategies is extremely important as a component or a FHP. This is another area where a veterinarian may be relatively weak and he or she may pursue additional training or outside help should their avicultural client need progressive and immediate result-producing programs installed.

Vaccination Programs

Although few vaccines are routinely used in non-domestic aviculture, this may become an impodant pad of a FHP in the near future. Before administering vacci-nes, veterinarians need to thoroughly understand the principles of vaccination in individuals and the flock, and must also be current with the latest advances in vaccine technology. If an aviary is already under a vaccination program, this program must also be critically evaluated for rationale and effectiveness as well as its cost must be included into the budget for the aviary.

Long Term Production Goals

The long term production goals are set with the aviculturist's ambitions in mind and can change as the FHP develops and matures. Ideally, veterinarians and their avicultural clients will prospectively work to define or achieve a bird selection protocol, food management program, an ideal breeding season's production goals, efficient labor system and improvement in the genetic quality of chicks produced. Long term production goals go beyond the scope of this paper, but will be addressed in future publications by the authors.

Consultant Duties

Finally, as a consultant, the veterinarian has several duties or obligations to their avicuitural clients. Obviously, we want to help our avicultural clients establish and achieve realistic goals as documented in the aviary's mission statement. As consultants, veterinarians must serve as a primary motivator in order for the FHP to be successful. Motivation includes regular production reports, complete with graphs, charts and/or tables clearly depicting the progress (positive or negative), periodic personal contact and/or aviary visitation and scheduled "producer" meetings to allow idea sharing, introduce new information and provide other forms of continuing education. These

forms of direct veterinary motivational interaction are vital to maintaining a dairy herd farmer's interest ant thus a successful herd health program. The authors feel that the same is true in flock health medicine and veterinarians should take an active role in motivating their clients, thereby helping to accomplish the aviculturist's goals.

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