



UNIVERSIDADE TÉCNICA DE LISBOA

Faculdade de Medicina Veterinária

UNDERSTANDING SHELTER MEDICINE

Tânia Isabel Gomes Frazão Pina Santos

CONSTITUIÇÃO DO JÚRI

PRESIDENTE:

Doutor Virgílio da Silva Almeida

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Doutora Ilda Maria Neto Gomes Rosa

Dr. Luís Miguel Alves Carreira

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DISSERTAÇÃO DE MESTRADO EM MEDICINA VETERINÁRIA

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DEDICATION

I dedicate to my seventeen year old female dog Funny that died during the writing process of the dissertation. She was the first shelter dog rescued by me and she came to me when she was ten years old, blind, with a mammary gland adenocarcinoma and with a pyometra.

She was always there during my veterinary course. She taught me to be persistent and never give up despite all the obstacles.

She is my motivation to pursue shelter medicine and to help other animals.

Rest in peace.



Special thanks to the doctors that helped during her final moments: Dra. Júlia Bragança, Dr. Sales Luís and Dra. Ana Paula.

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Thank you very much,
Tânia Frazão.

ABSTRACT

Shelter medicine is a small animal herd health discipline that is becoming an emerging area of specialization. This discipline rose from difficulties that shelter veterinarians face every day in local community shelters or supporting associations that protect the interests of animal well-being. The demands of veterinary health care when dogs, cats and other animals are housed together are so myriad, that demonstrates the necessity to establish protocols, standards, guidelines and the need to perform scientific investigations in shelter settings. Shelter Medicine also considers the demands of the community striving to find ways to reduce euthanasia and increasing the numbers of animals adopted. This thesis expects to describe the overall importance of Shelter Medicine and its main contents showing at the same time a practical evaluation application in a local Humane Society, in the USA, of the shelter medicine theoretical information available.

Key words: Shelter, Humane society, Shelter Medicine, disease, community

Compreender a Medicina de Abrigos

RESUMO

A Medicina de Abrigos, considera todos os actos médicos e cirúrgicos realizados em populações de pequenos animais indigentes, reunidos num mesmo espaço físico. Embora seja um conceito novo, ela assume-se já como uma área emergente de especialização no universo da Medicina Veterinária. A sua origem teve por base, a tentativa de suprimir as dificuldades que os Médicos Veterinários de abrigos, encontravam no seu dia-a-dia para garantirem a sanidade de toda a comunidade de que eram responsáveis, garantindo a defesa e o bem-estar dos animais indigentes. A sua vasta aplicabilidade e exigência de saberes demonstram a necessidade do desenvolvimento de protocolos e de linhas orientadoras, cujos objectivos finais se expressarão na redução do número de eutanásias, numa melhoria do estado hígido e das condições higio-sanitárias dos animais que constituem a comunidade (abrigo) e por fim no aumento do número de animais adoptados. A tese objectiva apresentar e aproximar o leitor a este novo ramo das Ciências Veterinárias – a Medicina dos Abrigos.

Palavras-chave: Medicina das Populações, abrigo, sociedades humanitárias, doenças, comunidade.

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LIST OF TERMS AND ABBREVIATIONS

Ab. – Antibiotic

ASV - Association of Shelter Veterinarians

BID - Twice a Day

BW - Body Weight

Cc - Cubic Centimeter Equal To A Milliliter

CDV --canine distemper virus

Ft – foot or feet (plural) – non-SI unit of length equal to 0.30 meters

HSP – Humane Society of Plainfield

HSUS – Humane Society of the United States

Hw – Heartworm

IV – Intravenous

K/A – Ketamine/Acepromazine

K/X – Ketamine/Xylazine

Kcal – kilocalories

Lb – Pound Equal to 0.45kg

P.E. – Physical Examination

PO – Per Os

QUID - Four Times a Day

SID – Once a Day

SPCA – Society for the Prevention of Cruelty to Animals (SPCA)

SQ – Subcutaneous

TID – Three Times a Day

UC Davis – University of California, Davis

URI - upper respiratory infectious disease

USA – United States of America

Vac. – Vaccine

VIN – Veterinary Information Network

PART I

Introduction

In February 2009, I had the good fortune to be able to do an externship to pursue my interests in shelter medicine, at Humane Society of Plainfield, Illinois, USA. I chose this new budding field based on my own experience that there are a high number of abandoned animals in Portugal. According to Jornal de Notícias (Pires, 2006), an annual average of 4900 animals are received in the animal protection associations, considering there is no national official statistic number. Also the conditions observed during my volunteer years in animal shelters associations, showed that they don't have the basic information on proper welfare and health care that meet the animals needs. I decided to find ways of improvement and share them. I found that a new veterinary preventive medicine specialty was emerging. Veterinary professionals can be educated to be able to act in three important stages of a relinquished animal's life: before entering in a kennel or pound, during the time housed with others until the animal is adopted and after adoption in order to prevent the relinquishment cycle.

Shelter medicine is recognized as an important type of production medicine, is seen as a small animal herd medicine, which the ultimate goals are: to reduce the numbers of abandoned animals and to increase the number of adoptions while working directly to find means of reducing euthanasia as control method for overpopulation, so eventually in the end it could be avoided.

The main objective of this dissertation is to provide information about shelter medicine. The information is based on scientific data, expert's opinion on messages boards, and/or the collective clinic impression of shelter veterinarians. It is divided into two parts. The first part is a summary of shelter medicine's major areas (sections) that are being developed. A brief introduction explains what shelter medicine is and what purpose has as a discipline, followed up by the contents of shelter medicine: husbandry includes shelter design, sanitation and nutrition. It represents a major challenge trying to select the best on budget according to species, ages, health and body condition of the animals housed; disease management section includes multiple strategies for maintaining healthy conditions and the search for resources to perform diagnostic tests and treatment protocols; shelter community section demonstrates the need to create programs to deal effectively with pet overpopulation and promote health and animals welfare in shelters and in the community, for example, behavior, foster care, spay/neuter efficient surgical techniques and ways to apply and reduce

euthanasia rate; because shelter veterinarians are usually confronted with animals that are relinquished to shelter, victims from animal abuse, the animal cruelty section demonstrates the responsibility of the veterinarian to report cases and, at the same time, be able to do a special physical examination to justify the report. The second part where my externship experience in the United States, Humane Society of Plainfield is described, permits to discuss direct observations confronting the practical results with the theoretical implications studied in part one.

SECTION 1

Overview of shelter medicine

The design of health care programs is a challenge taken up by veterinarians. The current increase demand for veterinary services can be partially attributed to the No Kill movement, which seeks to end euthanasia of adoptable animals as a population control method (Miller & Zawistowski, 2004). This first section provides an introduction into the world of animal sheltering history. It discusses the past of shelters and shelter medicine, makes a review of what shelter medicine involves and the role of shelter veterinarian revealing at the same time the importance of shelter medicine in a veterinary course curriculum.

1.1. History of animal welfare groups and the evolving animal shelter in the USA – The beginning

Dramatic changes in the past 20 years, have led to new policies and practices in shelters. Shelters originated from impoundments that were common in colonial towns and villages, which used to contain wandering livestock. Wandering dogs (strays) were picked up and taken to the impound or “pound”. When communities started to evolve, there was a division between farms and town, which changed the focus of the poundmaster from livestock to dogs and less extent to cats. Poundmaster received fees when animals were reclaimed or if not, they were able to slaughter and sell unclaimed livestock. Unclaimed dogs and cats could not be slaughtered for food and so limited efforts were applied to their death (Zawistowski & Morris, 2004).

ASPCA (American Society for the Prevention of Cruelty to Animals) was founded in 1866 by Henry Bergh, modeled after Royal SPCA (Society for the Prevention of Cruelty to Animals), the first animal protection organization, founded in England in 1824. The ASPCA was the first humane organization in the Western Hemisphere and its first focus was to advocate for the welfare of horses (Figure 1) that transported people (McKinney, 2009). In 1868 started to regard the treatment of animals in the pound and started to practice the payment of bounties for the capture of stray dogs (Zawistowski, 1998) and since then, have grown to encompass multiple types of animals and services (McKinney, 2009). New ASPCA's sister organizations started to appear. These would share common goals but were independent of a national structure. This independence contributed to the current state of the high localized nature and management of animal shelter programs.

Within Pennsylvania SPCA a single individual became a guiding force. Caroline White formed the Women's Branch of the Pennsylvania SPCA, when convention relegated her to a background role in the society which she helped bring about, in 1869. The Women's Branch of Pennsylvania SPCA figured prominently in the development of animal shelters, building the City Refuge for Lost and Suffering Animals, in response to the horrific treatment upon dogs and cats. It was the first facility dedicated to the humane treatment of animals that provided medical treatment, adoption and quick and painless death (Zawistowski & Morris, 2004).

Six years after Berg's death, the ASPCA took on the role of sheltering stray dogs and cats in New York City in 1894. In 1877 the American Humane Society¹ was formed, other rescue organizations followed, and there were anticruelty laws and humane societies formed as well (Zawistowski & Morris, 2004). In the early 20th century local governments began to take responsibility for animal control, providing dog catchers and pounds in which to house stray animals and eventually added the responsibility of taking in any animals that were relinquished by their owners. Most were killed at government expense. In the 60s awareness developed of the extent to which viable and desirable animals were routinely being destroyed. This gave rise to the rescue movement and what evolved to the types of animal welfare agencies. Government run pounds relabeled themselves as shelters, which performed the same function as the pound had previously, but also actively worked to re-home animals in the local community and advocate for responsible animal ownership. Breed specific rescues developed to rescue purebreds from the pound or directly from owners who no longer wanted the animal. Not for profit privately run shelter emerged with the goal of moving desirable animals at the pound destined to be destroyed to areas with an increased possibility for re-homing (McKinney, 2009). Animal welfare agencies are described in detail in section 2.

Private shelters make possible a win-win situation for the animal rescued and local governments, reducing their financial responsibility for housing, killing and disposing the animal. Consumers also benefit by the additional medical attention and behavior evaluation done at these facilities, seldom done at government shelters (McKinney).

¹ The first Humane Society was found in England in 1774. It was dedicated to saving drowning humans. The jump to its modern application to organizations dedicated to saving animals happened approximately 1880s when Bergh, founder of ASPCA removed a child from abusive home, merging saving animals and children missions. The confusing names appeared reflecting these two missions as a Society for the Prevention of Cruelty to Animals and Humane Society. When local government assumed enforcement of child protection, it left to the animal shelter a name with a confusing legacy (Zawistowski & Morris, 2004).



Figure 1 - ASPCA historic seal (from ASPCA, 2010).

1.2. History of veterinary shelter medicine and what it involves

By 1900, sheltering moved to a primary emphasis on dogs and some extent on cats. Veterinary Medicine did not experience this shift until World War II. On and of veterinarians were in conflict with shelters sometimes over business practices sometimes over ideology. In the past, veterinarians were called to a shelter in response to public criticism or a disease outbreak. In addition municipal shelter policies were often aimed to animal control and not animal health and welfare. Euthanasia was the primary weapon against disease and overcrowding and it seemed that the demand for veterinary care was minimal (Miller & Zawistowski, 2004). Today, the contribution of Veterinary Medicine in shelters focuses, by contrast, on keeping animals healthy for a short but critical time period. Population-level health care, when it has been addressed at all, has commonly been the responsibility of shelter managers with little or no medical training. An increased focus upon animal welfare from within and without veterinary profession necessitates a new, more cohesive role for veterinarians in animal shelters (UC Davis Koret Shelter Medicine Program [UC Davis], n.d.).

Veterinarians have been working with shelters and homeless animals for many decades, but it has only been relatively recently that the formal specialty of “Shelter Medicine” has been acknowledged as a defined area of teaching, research and practice. The first shelter medicine class was offered at Cornell University in 1999 (UC Davis, n.d.).

1.3. Role of Shelter Veterinarian

Veterinarians provide health care in shelters, offered through a variety of contractual arrangements from fees to free services, from full time shelter veterinarians to on-call service or periodic service to perform examinations, rabies vaccinations and spay/neuter surgeries. Besides medical care, shelter veterinarians may have other functions, for example, administrative roles when joining directory and advisory boards. They may also provide non-veterinary opinions solicited to set overall policy guidelines for: staff and volunteers

programs; behavior evaluations; adoption programs; designing shelters, sanitation, behavior and environment enrichment, foster care, feral cat management, euthanasia programs, staff education, and so on. Participation on media events, work with investigators on cruelty investigations may also be required (Miller, 2004). In the end, veterinarians have an important role helping the shelter to meet and maintain the standards that will make it an outstanding facility.

Employment at shelters is becoming an attractive career option as shelter focus less on euthanasia and more preventive health care and treatment programs (Miller, 2004). Academic shelter medicine is also a growing field becoming increasingly common internships, residency training and teaching positions (UC Davis, n.d.).

1.4. The necessity of a shelter medicine curriculum in veterinary schools

The demands upon shelter veterinarians are myriad (see role of shelter veterinarians) requiring knowledge and skills, that far exceed what is acquired via formal training at the veterinary college (Miller, 2004).

As a discipline, Shelter Animal Medicine is relatively new (Luciani, 2008).

Shelter Medicine is seen as a herd health discipline. The traditional large animal practice involves health final decisions determined by economic value of animals. The small companion medicine shifts to an emphasis on individualized treatment protocols that have no economic value of the animal, often seen as a member of a family. Veterinarians working in the animal shelters have a major dilemma which is to find means of manipulating herd health management and to deliver high quality health care to individual dogs and cats housed together, where disease outbreaks occur and traditional methods of disease eradication and control, like euthanasia, are generally not accepted in modern shelters (Miller, 2004). The main goal is to treat dogs and cats individually as if they are part of a herd, but this is a difficult task because keeping exposed and sick animals in the shelter jeopardizes the health of a current population. According to Miller (2004) and Kuehn (2004), URIs and ringworm are typically not threatening to the individual animal but could be lethal in a herd setting. "Questions are being asked for which no answers currently exist" (Miller, 2004, p. 96). The search for information for effective disease management strategies is based on few scientific data in shelter patterns, expert's opinion on messages boards, and/or the collective clinic impression of shelter veterinarians (UC Davis Koret Shelter Medicine, 2007). This is why shelter medicine scientific research should evolve. Since the first shelter medicine class was offered, Shelter Medicine as an academic enterprise has expanded (UC Davis, n.d.). Today, some form of shelter animal medicine is taught at veterinary colleges or schools at Cornell, UC Davis, Auburn, Iowa state, Oklahoma State and Ohio State and Pennsylvania State, all in

USA. As a discipline will impact all students, ensuring they will be able to master certain surgical techniques and also learn about other issues facing companion-animal veterinarians and animal shelters, including emergency medicine, infectious disease, parasitology and behavior, and the medicine of the communities facing the patient not only as a individual, but as a individual that belong and it is integrated in a population with a high variety of different factors. The surgical component, once implemented, could directly increase the number of companion animals spayed and neutered in the area (Luciani, 2008) and available for adoption. At the same time, improves students learning objectives and skills that are best learned with the use of live animals (Patronek & Raunch, 2007). A shelter animal medicine course, coupled with a student surgery suite and a partnership with city shelters, will provide the highest quality of education to future veterinarians, who as a result, will be better prepared to enter the profession and practice veterinary medicine, whether in private practices or in shelters (Luciani, 2008).

SECTION 2

Animal shelters and their functions

2.1. Types of Animal Welfare agencies and functions

Animal control agencies can be a separate county, city municipal agencies or animal organizations (Humane Society or SPCA) that contract with local governments to provide animal control services (Griffin, 2009). They can also be found under the name of "Animal Services" and many will have Animal Control Officers (Guerrero, 2008).

The emphasis of animal control program is generally based on public health and public safety, law enforcement (local ordinances), animal regulation, and licensing (Maddie's Fund, 2008), humane treatment of animals, and the pickup and housing of stray animals for example, in humane societies (Guerrero, 2008). In most areas, by law (or local ordinances), animals considered strays that are found by the public have to be relinquished to these agencies (Guerrero, 2008).

Humane Societies are groups that vary. There are some national agencies and thousands of smaller ones across the United States. Standard guidelines are suggested by the 3 biggest associations: American Humane Association (AHA), the Humane Society of the United States (HSUS) and American SPCA (ASPCA); each one is a private organization and not related to the others. They do not house animals, but work for the national (and sometimes international) welfare of animals. There are no national umbrella organizations or local chapters. Each society is autonomous and independent and has its own board of directors, mission, philosophy and its own individual programs and services (Maddie's Fund, 2008). Humane Society and SPCA terms are interchangeable (Maddie's Fund). Many of these types of agencies are nonprofit groups. Many facilities or organizations will provide sheltering for owner relinquished animals only and will not take strays; others will contract with local cities and provide animal control and sheltering functions also. Some will not have facilities but will provide foster homes for animals in their area, or raise funds for animal related projects (Guerrero, 2008). They usually provide a variety of charitable services in addition to having an adoption program. These might include spay/neuter, humane education, dog behavior training or animal assisted therapy programs. Many also investigate and prosecute cases of animal cruelty. Non-contracting Societies will receive the majority of

their funding from philanthropic sources, individual donors, bequests or grants, while those that perform animal control duties will receive a portion of their funding from the taxpayer (Maddie's Fund, 2008).

2.2. Animal Welfare agencies statistics

There are about 5,000 community animal shelters nationwide that are independent and no government institution or animal organization is responsible for tabulating national statistics for the animal protection movement (American Society for Prevention of Cruelty to Animals [ASPCA], 2010). However, the National Council on Population Study and Policy (NCPSP) has conducted studies regarding animal entry and exit numbers from shelters nationally and the characteristics of animals and humans involved in relinquishment of animals to shelters (National Council on Pet Population Study and Policy [NCPSP], 2008). The American Pet Products Manufacturers Association (APPMA), along with the American Veterinary Medical Association, edits resources for statistics on pets and pet ownership in the United States. APPMA publish every other year the *APPMA National Pet Owners Survey* (American Pet Products Association [APPA], 2009), and AVMA also edited the U.S. *Pet Ownership and Demographics Sourcebook*, in 2007 (AVMA [AVMA], 2007).

Statistics data about USA animal shelters, pet ownership and overpopulation facts is included in Appendix 1.

The data is from ASPCA (2010) and Humane Society of United States [HSUS] (2009) estimates, unless other sources are indicated.

2.3. Types of shelters

There are many different types of shelters. A traditional shelter is generally an open door SPCA or Humane Society (Maddie's Fund, 2008). They can be classified as municipal, private; "open admission" or "no kill" (limited admission). There are also animal sanctuaries, breed and animal rescue groups. By contrast, animal sanctuaries will look after animals for the rest of their natural life, without necessarily attempting to find them a home (Miller, 2004). Rescue groups are usually small, all volunteer, no-kill, organizations. These groups are sometimes partial to a particular breed of dog or cat (a purebred rescue group) or to feral cats. They generally do not have shelters, but use a network of foster homes to house homeless animals until the cats or dogs can be permanently housed (Maddie's Fund, 2008). The municipal and "open admission" are primarily concerned with animal control and don't turn animals away, it accepts every cat and dog that is brought to its doors, irrespective of age or condition (Maddie's Fund, 2008). These shelters range from being marginally funded

by the city and managed by the police department with minimal standards to well funded with the highest standards of care developed by animal care professionals (Miller, 2004). However, are generally faced with space constraints and limited resources, and, as a result, euthanasia is used as a means of pet population control (Maddie's Fund, 2008).

Humane Societies or SPCAs contract for animal control and receive municipal as well private funding and because private funding is limited (private or municipal); it restricts the implementation of optimal health care protocols. There is also local SPCA or humane society private shelters that have no municipal funding and, although also bounded to legal restrictions imposed by local/state government, their internal policies affect many of decisions a veterinary must make (Miller, 2004).

Private, no kill shelters generally state as an internal policy not to euthanize "adoptable" animals, eliminating the use of euthanasia to control overcrowding or manage disease outbreak, maintaining the right to refuse animals when they run out of space (Miller). No kill-term is misleading because many of these shelters still euthanize to prevent overcrowding or reserving it for the non-rehabilitatable animals, according to Maddie's Fund definition, while saving all the adoptable and treatable animals they take in (Maddie's Fund, 2008). It's important to know that No-kill shelters may keep animals for several months to years before being adopted while increasing the demands for veterinary health services because of disease outbreaks (Miller, 2004). No-kill shelters are generally considered limited access and do not take in animals beyond their capacity to adopt or rehabilitate them (Maddie's Fund). There are myriad variations within these categories because there are no standard definitions.

2.4. Mission and shelter philosophy in civil society

The goal to every shelter should be to advocate for animals (attempt to recover the bond between clients and animals) while providing comfortable and a sanitary environment in which: stress is minimized, husbandry standards that focuses on a proper nutritional diet, exercise and behavioral enrichment are maintained; foster care for sick and debilitated but adoptable animals is provided; the health care is met while optimizing the use of available resources and where continuing staff and volunteer training exists along with humane euthanasia (Miller, 2004; Otteman, 2007). In the end, shelters have two missions: to serve the animal and the community needs.

2.5. Terms and definitions

In 2004, a group of animal welfare leaders was created to build bridges across different philosophies, create relationships and focus goals on reducing euthanasia of healthy and treatable animals. They drafted definitions and examples of animal statistics formulas, to facilitate the data collection process and assure consistent reporting across agencies, in hope to be applied as a standard for categorizing dogs and cats in each organization.

Asilomar Accords (2004) list of categorizations/definitions considered important for this thesis is included in Appendix 2.

Types of shelters definitions including Asilomar Accord's categorizations:

Traditional shelter: animal organizations that manage shelter populations by euthanizing animals that are considered to be adoptable ("healthy") or treatable in addition to non-rehabilitatable animals (Griffin, 2009);

Adoption guarantee shelter: organizations that save all the adoptable ("healthy") and treatable animals under their care, with euthanasia reserved only for untreatable/non-rehabilitatable animals (Griffin, 2009).

2.6. Adoptable definition and strategies to save the greatest number of lives

Adoptability is defined by each agency being affected by many factors like resources (ability to treat disease, isolate sick animals, expertise of the staff in treatments and so on) and willingness of the public (Miller, 2004). Lots of organizations are following different paths to achieve a common goal of saving lives. For example, some organizations are strictly working to save the animals within their own community. As all of the community's adoptable animals are saved, the organizations begin to save "treatables"; however, there is a higher cost per placement. This occurs because treatable animals have medical or behavior problems that require interventions prior to rehoming and this can be expensive, but more animals from within the community will have an opportunity to be placed. Another approach used by some organizations is to save animals from outside of the community that are easier to place ("adoptable"). The purpose of this strategy is to save the greatest number of lives and reduce the lifesaving cost per animal (Maddie's Fund, 2008).

2.7. Veterinary organization: the Association of Shelter Veterinarians

Established in 2001, the ASV sponsors continuing education for shelter veterinarians and hosts a mailing list serve that is a forum for veterinarians to share opinions and hard-to-find

information, as well as to offer peer support (Griffin, 2009). The association is pursuing board-specialty status for the field. Programs in shelter medicine are offered at a number of U.S. veterinary schools (Grace, 2008). It also develops position statements, revised and updated when necessary, in response to the growing demand from ASV members, state veterinary boards and animal shelters for guidelines and expert opinions on a variety of medical and management subjects. These are offered primarily as a service to members to help raise the standards for animal shelter medicine (Association of Shelter Medicine [ASV], n.d.)

SECTION 3

Husbandry

Preventive measures and changes in shelter design and sanitation procedures often find some of the most challenging demands because solutions to disease transmission are not always medical and often rest on husbandry (Miller & Zawistowski, 2004, p. 53). Very few shelters are built to maintain an environment necessary to sustain the health and safety of staff and the animals and so, veterinarians are part of the management team that examines shelter environment, to identify and remedy physical facility problems (Johnson, 2004).

3.1. Animal Shelter Building: Design

The following information is based on the information sheet of UC Davis Koret Shelter Medicine Program (2007), unless other sources are indicated.

Early in the process of considering new or expanded facility it is important to consider the building shelter goals that are different on management philosophy, resources and challenges to a particular community. First, it is important to define the required amount of holding spaces for individual animals, taking into consideration intake numbers and holding time per animal (legally required hold time plus time for adoption and medical treatment). It must be provided maximum number anticipated for a given month. The National Animal Control estimates ten minutes to daily clean and care for one animal, not including general area cleaning, behavior evaluations, and so on. At minimum no more housing should be built than staff time is available for maintenance. Flexible space should be included.

The transmissions of the majority of diseases in the animal shelters are by fomites, environment contamination and direct animal contact. Fomites include dishes, bedding, leashes, and the most important the hands and clothing of animal care staff that occurs when animals are handled for cleaning. Fomites are important and it is a common misconception that the majority of diseases are airborne in the shelter setting (Johnson, 2004), especially in cats, that aerosol transmission in upper respiratory infection plays little role in the contagiousness. Coughing or sneezing cats are unable to generate aerosols that will spread than 4-5 feet (unlike dogs that are thought to be able to spread pathogens up to 20 feet), so healthy cats housed in the same air space as sick cats remained healthy as long as fomite transmission was prevented primarily by assigning different caretakers (UC Davis, 2007).

Housing should be designed to minimize fomite transmission by staff, especially during cleaning. Figure 2, demonstrates an example of conceptual facility design for a small shelter with 5,500 square feet of area, 90 feet by 70 feet dimensions and a capacity of housing 20 dogs and 30 cats (HSUS, 2010).

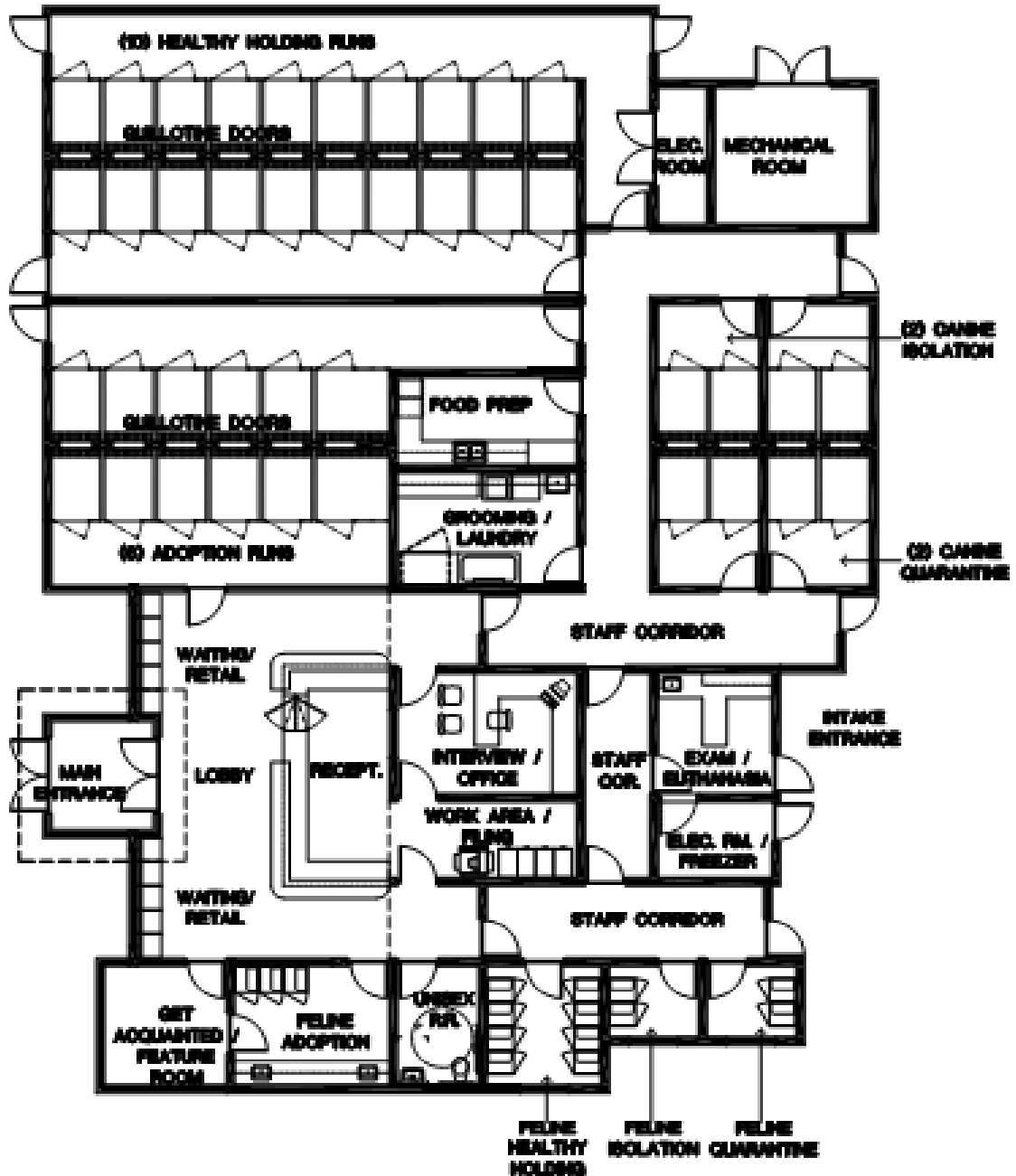


Figure 2 - Small shelter floor plan 1 design (from HSUS, 2010).

It is not recommended handling animals during cleaning. For dog areas runs separated by guillotine doors (Figure 3) are advised especially for dogs that are newly admitted, sick or potentially aggressive. It simplifies the cleaning process because it allows isolating a dog on

one side of the run while the other side is being cleaned (Humane Society of the United States [HSUS], n.d.). It is advised double sided-cages (Figure 4) in all cat housing (UC Davis) and a minimum space of 9 square feet is recommended per cat (HSUS).



Figure 3 - Double run with a guillotine door (Jones, 2007)



Figure 4 - Double sided-cages for cats; it is also an example of a double-decker (Jones, 2007).

Guidelines or recommendations for housing dogs vary but according to HSUS. The minimum space depends, if dogs are housed in kennels then should be of 4 ft by 6 ft or if in runs should be 4 ft by 8 ft. According to their weight there are also guidelines for the height of cages: dog weight more that 50 lbs should be a 24 sq. ft; between 36-50 lbs a 20 sq. ft.; and between 10-35lbs a 12 sq. ft. height cage. Smaller cages are accepted for small dogs and treatment areas, isolation and recovery rooms, where restricted movement is necessary (Miller, 2004). For group housing (Figure 5), HSUS recommends that each dog should have a minimum of 4 feet by 4 feet of floor space. Group housing for cats is more common than for

dogs, despite the increase in upper respiratory infections, ringworm or stress induced illness (Miller, 2004). HSUS recommends a maximum 15 adult or 20 kittens in a 10 ft by 15 ft. room.



Figure 5 – Group housing for dogs (From Jones, 2007).

The HSUS strongly discourages using triple-decker cages for any animal, as well as double-decker cages and kennels for dogs and puppies. They are not only impossible to clean, but also pose a danger to kennel staff when animals need to be placed in or removed from the cages. Double-decker cages, as shown in Figure 4, are acceptable for cats if they are not positioned too high along the wall (HSUS).

Access to outdoor air and sunshine is recommended for both dogs and cats (Figure 6), especially in mild climates (Antoniades, 2004), minimizes disease risk factors, such as airway irritation. Exercise areas should exist and be provided for dogs with outdoor access in their run because they require daily exercise outside of their run (HSUS), and these areas are also important for dogs held for long periods of time (Miller, 2004).



Figure 6 – Outdoor enclosure for cats (From Jones, 2007)

Shelter should have capacity for single animal housing; exceptions are litters or bonded pairs that come together. Housing should be design to prevent contact between animals in adjacent cages (nose to nose contact, feces or urine leaking from another cage). Segregation in shelter with designated areas should exist for dogs and cats, young animals

and adult animals and infectious or potentially infectious animals. Smaller the populations the less likely to a large outbreak disease occur (Spindle & Makolinksi, 2008). The sub-populations that are particularly important are: sick animals (respiratory disease, diarrhea, ringworm, mange...) always separated by species to avoid species-emerging pathogens that pose potential zoonotic risk; animals recovering from illness; young animals under 5 months of age; different species (dogs, cats, also rabbits, wildlife); newly admitted animals, animals in rabies quarantine, legally impounded animals, males versus females, nursing mothers, feral cats, animals available for adoption versus owner relinquished animals (UC Davis, 2007).

Possible design should permit all-in/all-out housing normally used to minimize disease in livestock production. In this system all animals are generally moved into a particular housing area at once, without additional animals being continually added, and all leaving the housing area together. The area is cleaned before new ones come in. In shelter that has limited admission or is fast turn-over, it is possible to practice but difficult in open intake shelters although it should be practiced to the extent possible and will be much easier implemented if the shelter has more numerous smaller rooms (UC Davis, 2007).

To minimize disease transmission by environmental contamination shelters should be designed to allow fewer changes in housing like moving from holding areas to adoption areas may be counterproductive in terms of animal health and stress that leads to viral shedding in cats. Ultraviolet lights have a disinfectant activity and are recommended to housing areas.

Other considerations about ventilation, plumbing systems, noise, feeders and waterers, flooring, lightning, security and other to take into consideration when designing shelter building are included in Appendix 3.

Stress in the shelter is often particularly severe, in addition to the link between stress and disease, especially for cats. To reduce it (Miller, 2004, table 8.2) advises low-stress housing by providing:

- The best nutrition affordable to meet individual needs;
- Comfortable environment
 - dogs should be provide with mats, resting boards, blankets, towels especially if they have short thin hair coat, being held for long time.
 - Sick or injured cat's cages should have litter boxers (preferably disposable), elevated resting shelves or perches, scratching posts and toys; for households with multiple cats should be provided at least on litter box per cat plus one.
- avoid overcrowding;
- minimize noise;

- establish routines;
- turn lights and music off at night.

3.2. Animal Shelter Building: Sanitation

In order to prevent disease, there's a need to ensure sanitary conditions in the all animal housing areas, especially those areas where they are not yet sick or are vulnerable, like new intakes and young animals (UC Davis, 2007)

Failure to control fomite transmission through sanitation may be a major contributing factor for a disease outbreak (Miller, 2004). A review of a sanitation protocol is often more valuable than changing vaccination protocols or other veterinary procedures (Miller, 2004)

Sanitation consists in cleaning and disinfecting which occur at different times and require different steps. A written protocol is advantageous for an effective sanitation as well as kennel staff education (Figure 7).



Figure 7 - Kennel staff education about properly cleaning procedures is essential (From <http://www.petsmartcharitiesblog.org/slides2/sanitation.pdf>).

Spindle & Makolinski (2008) emphasizes that animals, environment, pathogens and shelter operations themselves contribute to the spread of disease and the goal of a good sanitation program should be to understand the relation of all of these factors in an individual facility with the objective to limit disease outbreak and zoonotic disease. There is not a universal sanitation plan to every facility. When designing a new plan, the authors suggest considering the following factors: the surfaces in need of cleaning, common infectious agents, the cost of sanitizing agents, and the willingness of kennel staff to comply, and so on.

Briefly the authors explain that sanitizing as mentioned is a two-step process and is accomplished through cleaning and the application of a chemical disinfectant. Cleaning is the first step and involves the manual removal of dirt and organic debris from all surfaces in addition to washing with hot water and soap. Cleaning does not kill pathogens, but mechanically removes them or reduces their presence and is normally followed by

disinfection. It inactivates the pathogens that were not removed in the first step. Effective chemical disinfection requires an effective cleaning, an application of the product after proper dirt and organic material removal, allowing sufficient contact time (usually 10 minutes), the use of the correct agent to inactivate the pathogen, appropriate dilution, rinsing in some cases, and following label directions.

The categories of products available for sanitation, as Spindle & Makolinski (2008) compares are: soaps and detergents (cleaning agents) which work by suspending dirt and grease and breaking up organic matter (dish soap is a common shelter detergent; degreasers are strong cleaners formulated for removal of tough oils and greasy buildup); disinfectants are chemical solutions which kills germs. The particular germs killed depend on the ingredients. While some disinfectants serve a dual purpose and have some cleansing properties, many disinfectants do not effectively remove dirt and grease. Bleach, quaternary ammonium products, and Trifectant®² are examples of common shelter disinfectants and some basics about these shelter disinfectants are listed in Table 1.

Table 1 - Some basics about common shelter disinfectants (from Spindle & Makolinski, 2008, p. 13)

Disinfectant Name	Common Name	Pros	Cons	Contact Time
Sodium Hypochlorite	5% Household Bleach	Inexpensive Effective against ringworm when used at 1:10 dilution Effective against parvo, panleuk at 1:32 dilution	Inactivated with organic material No detergent activity (cleaning step required) Irritating fumes and corrosive at higher concentrations Needs to be prepared fresh daily and protected from light	10 minutes
Quaternary Ammonium	Roccal Kennelsol A-33 Others	Some detergent activity Mild inactivation with organic material	Not reliable against parvo virus, ringworm, or panleukopenia Inactivated by soaps	10 minutes
Potassium Peroxymonosulfate	Virkon-S Trifectant	Some detergent activity Stable for 7 days when mixed from powder Less inactivation with organic material Low tissue toxicity	Not reliable against ringworm More expensive	10 minutes

Hurley (2006) points out some agents that are not killed by routinely used disinfect (Table 2). In order to prevent what cannot be killed or what cannot be cleaned, the author asserts that if a stainless steel cage gets contaminated with ringworm, a properly mechanic cleaning will remove the fungus; in a house group cat room contaminated with feline herpesvirus, if something is hard to clean, the virus doesn't persist in the environment more than a day or two. The author notes for agents, like ringworm, resistant to disinfection together with something difficult to be cleaned, quarantine, careful screening and/or prophylactic treatment

²It is a bactericidal, fungicidal and virucidal broad spectrum disinfectant from Vetoquinol®

for hard-to-kill pathogens in hard-to-clean areas is so important. Hard-to-clean areas often include feline group housing, play yards, staff offices and foster homes. The author suggests: quarantine 1-2 weeks for parvovirus and panleukopenia; screen for ringworm; treatment for roundworm, hookworms and in high risk populations, treatment for coccidia, giardia and whipworms; make sure puppy, kitten, new intake and sick areas are cleanable and maximize sunlight on grass.

Table 2 - Selected agents not killed by routinely used disinfectants at normal concentrations. Adapted from Hurley (2006, p. 5)

Ringworm (<i>Microsporum canis</i>)
Only thing that inactivates ringworm completely in one application is undiluted 5% bleach or formaldehyde; too harsh for shelter use (Murielle, 1995 p. 68 as cited in Hurley, 2006). 2 applications (24 hours apart) of bleach diluted 1:10 (1.5 cups 5% bleach per gallon of water) is reasonably effective
Internal parasite eggs such as roundworm, whipworm
Can be dislodged from smooth surfaces following damage to outer protein coat by 1% bleach (3 cups 5% bleach/gallon of water) (Bowman, 1999 p. 150 as cited in Hurley,2006). Consider prophylactic treatment to avoid environmental contamination
Coccidial and protozoal cysts (such as toxoplasma, cryptosporidia)
Best killed by high temperature steam heat i.e. commercial dishwasher Consider prophylactic treatment to avoid environmental contamination
External parasites such as cheyletiella, scabies (sarcoptic mange) and fleas
Especially when home-like environments become contaminated Pesticides required for effective elimination (Moriello, 1992, p161 as cited in Hurley, 2006). Consider prophylactic treatment to avoid environmental contamination

In general, cages and minimal enclosures should be disinfected at least once daily, between different occupants and as frequent as necessary to ensure the animal is kept clean, dry and comfortable (Miller, 2004). It is advised in case of group housing to clean twice a day, but disinfect less frequently, for example twice a week, if it is a stable colony and no new residents are introduced until all colony have been adopted (Miller, 2004).

It is important to know the limitations of sanitations because dirt and gravel cannot be chemically disinfected and 12 inches must be replaced to render it safe again if contaminated with parvovirus (personal communication with Dr. Janet Folley as cited in Miller, 2004, p.

106). Stainless steel, sealed concrete, non-porous plastic, and disposables are preferable. (Spindle & Makolinski, 2008)

Based on Miller (2004) and Gilman (2004), a brief review of sanitation procedures is described:

- establish a diagnosis and determine etiology;
- identify appropriate disinfectant;
- observe staff cleaning procedures: removal of all materials and organic debris from cage, use of proper water and detergent, cleaning entire cage, and so on;
- verify proper usage of disinfectant: proper mixing and application;
- remove animals from cage and make sure they are not wet during cleaning process;
- increase frequency of cleaning if shelter is using single product as detergent and disinfectant
- avoid high pressure hosing and common drainage;
- Use disposable rags and paper towels – avoid sponges and mops in animal areas;
- vacuum, clean and disinfect vents, check and replace filters;
- ensure workers cleaning multiple areas start in the healthiest first and progress towards disease areas;
- Staff must utilize safety equipment when cleaning – eye goggles, masks and gloves;
- disinfect transport cages and communal animal holding areas.

3.3. Nutrition

Nutritional needs and feedings of shelter animals is an important component of shelter care, because poor nutrition, in animals whose health is compromised increase the disease susceptibility and disease spread. Animal shelters receive various ages, reproductive status and health and body conditions, that need to receive the proper amount and quality of nutrients. The selection is made balancing the nutritional requirements and the financial and staffing resources. References supplying the information about nutrients for cats and dogs, as valuable reference for all persons interested in companion animal science, are the National Research Council 2003 documents and Association of American Feed Control Officials 2002 publication (Case & Fahey, Jr., 2004; National Research Council [NRC], 2003; Association of American Feed Control Officials [AAFCO], 2002).

Cats as a strict carnivore, whereas the dog is an omnivore, have unique special needs that result in more stringent dietary requirements than dogs and the kennel staff must be aware that they cannot be fed similarly to dogs (Case & Fahey, Jr., 2004). Cats' requirements include higher concentrations of dietary protein, for the amino acid taurine, for arachidonic acid, for preformed vitamin A, unique features of glucose, sensitivity to arginine deficiency

and inability to convert tryptophan to niacin (Case & Carey, et al, 2000). When feeding cats, texture and moisture are important considerations since they select a moist diet over a dry with the exception if they have been fed a dry for long periods. Dry food offered free choice is the most practical means of feeding with fresh food offered daily to prevent spoilage that would hinder normal consumption. Most adult dogs are capable to consume their daily energy in a single meal but are best maintained feeding 2-3 portion controlled meal, either canned or dry food. In shelter settings multiple feedings are preferable, considering the growing dogs and gestating/lactating bitches, and the advantages of helping alleviate boredom, facilitate staff interactions with animals and reduce the risk of gastric dilatation/volvulus in susceptible breeds (Case & Fahey, Jr., 2004)

Shelter needs to adjust the nutrition according to different life stages and conditions.

The primary nutritional goal to an **adult animal** in a state of maintenance is to attain (or maintain optimal body condition, weight and promote health, by feeding animals with a high quality food formulated for maintenance. Feeding a poor quality dry food, certainly convenient and cost effective, regardless of any type, will cause diarrhea, loose stools and compromise the health (Case & Fahey, Jr., 2004). This is important; diet diarrhea can be confused with infectious disease leading to unnecessary treatment or isolation (UC Davis Koret Shelter Medicine Program, n.d.)

Neonates, litters of newborn kittens or puppies, with or without the mother, need proper nutrition during this critical period for preventing mortality. One of major concerns is to know if they receive the proper colostrums during the first 48 hours of life, when the gastrointestinal track is permeable, because it provides immunological and nutritional benefits. Kittens or puppies until they are 4 weeks of age require only the mother's milk if she is well-nourished but in shelters is often necessary to supplement with a commercial milk replacer (10 to 20 mls each feeding for newborn puppies and 1/3 to 1/2 of this amount to kittens, usually practical four to five times per day), if there's no mother or she is underweight with poor health. At this age, they can start to be nutritional weaning offering a commercial food specifically for weaning or a thick gruel by mixing water with commercial puppy or kitten food. Cow's milk should never be used because of its higher content of lactose than bitch's or queen's milk and cause diarrhea. Fresh food should be allowed several times a day and removed after 20 minutes. By six weeks nutritional weaning is complete by consuming only dry food (Case & Fahey, Jr., 2004).

During the first three weeks of life, puppies increase 10 percent BW/day and kittens 10-15g/day (Daristotle & Tetrick, et all, 2002)

According to Malm and Jensen (1996), there's also behavioral weaning that should not be instituted before seven weeks of age. It's important for psychological and emotional development they continue suckling even they have free access to solid food.

Shelters receive a substantial proportion of **adolescents**, especially dogs. Proper feeding and nutrition of kittens and puppies is essential during the first six to twelve months, because they are developing. There's a high-energy requirement in growing dogs and cats with the need to consume higher quantities and the diet's digestibility and energy density are important considerations because puppies and kittens are limited in the amount of food that can be consumed in a single meal, so if the diet is poorly digestible or has low energy they need to consume more but the limits of stomach can be reached before adequate nutrients have been consumed, compromising the growth. Excess consumption of food can cause intermittent diarrhea, often exacerbated by the stress of a kennel environment (Case & Fahey, Jr., 2004). General guideline for a young dog's energy intake should be approximately two times maintenance until 40 percent of adult body weight has been reached. Then, intake should be reduced to 1.2 times maintenance when the dog has reaches 80 percent of adult size (Daristotle & Tetrick, et all, 2002). For cats, one month after weaning, are estimated to be 200 to 250 kcal/kg BW and slowly decline to 90 to 100 kcal/kg between six to nine months, and puppies and kittens under six months of age should be fed premeasured food three to four times a day (Case & Carey, et al, 2000). Young animals benefit more from eating diet growth high quality commercial foods for than economical generic label brands (Case & Fahey, Jr., 2004).

Pregnant queens and bitches need highly digestible and nutrient dense, consuming the extra energy without necessitating excess volume consumption. At the end of gestation, the female should be receiving 25 to 50 percent more food than her normal maintenance needs. After parturition, they will be eating after 24h and need to receive adequate fluid which is essential for normal milk production. During lactation, energy and water are the important nutrients. The females require two to three times normal maintenance energy until the kittens and puppies are of weaning age. If a mother has a large litter or is mal nourished, is a good advice supplemental feeding of puppies and kittens, reducing the mother's energy loss (Case & Fahey, Jr., 2004).

Older animals are especially vulnerable in the shelter environment because of the stress and increase incidence of disease. Considering the physiological changes which directly affect the nutrition and feeding, older dogs suffer a decline in the resting metabolic energy rate of 20 to 40 percent, caused by natural age-associated decrease in lean body tissue and by the reduction in activity (Case & Fahey, Jr., 2004) but they maintain the efficiency to

digestive efficiency (Anantharaman-Barr & Gicquello, et al, 1991). Unlike dogs, cats lean body mass does not decrease appreciably and they also vary in voluntary activity, so they don't show a need for reduction in their daily energy requirement (Case & Fahey, Jr.) but their declines slightly and the nutrient that is most affected is fat (Anantharaman-Barr & Gicquello, et al), they seem to compensate with slightly increasing the amount of food they consume. Shelter staff must be aware that older cats (but not older dogs) may actually need more food each day than adult cats of same weight (Case & Fahey, Jr., 2004).

Chronic disease presents an additional challenge when caring for older animals. Health problems more common than in the young are: chronic renal disease, diabetes mellitus, constipation and neoplastic disease (cancer). Dietary changes often help relieving symptoms or slowing the progression of some diseases. For older animals there are two main categories of commercial pet foods: those with a decreased caloric density or low fat and those that are calorie and nutrient dense for older animals that experience loss of body weight or chronic disease. It is recommended to monitor feeding with a pre-measured quantity of food that also facilitates monitoring animal health (UC Davis Koret Shelter Medicine Program, 2007). During periods of stress, animals refuse to eat, especially important in overweight cats in risk of developing hepatic lipidosis. The best choice of food for stressed animals, those who have stopped eating, are underweight or have dental problems, is canned food. To overweight adults the quantity of food offered should be gradually reduce, achieving a moderate rate of weight loss (Case & Fahey, Jr., 2004). Canned foods and dry foods to which warm water has been added are highly palatable. For dogs, because eating is a social habit, the presence of another dog can motivate a dog to eat or in case of a nervous dog should be provided a quiet place. For cats, different canned food flavors can be used to attempt a cat to begin eating. If a cat has URI, the ability to smell is compromised and they may be courage to eat in presence of foods with a strong aroma (adding tuna or sardine juice). Highly digestible and nutrient dense is recommended for stress animas, underweight or malnourished (Daristotle & Tetrick, et all, 2002), and should be fed numerous small meals, several times a day. In all cases, appropriate diets should be selected based on animal needs, health and weigh. The selection is often difficult and the food purchased should be balanced, meet the physiological needs of shelter animals and the AAFCO standards as a complete diet. If a new food is introduced the diet should always be changed gradually, a four to seven day period (Case & Fahey, Jr., 2004).

SECTION 4

Disease management

Opportunities for animals to become exposed to infectious pathogens may be greater than in other environments, because the behavioral and medical histories of shelter animals are often unknown, and consequently keeping animals for several months to years before they are placed has shown that animals have a high risk to contract disease. Howe et al (2001) showed that puppies that contracted parvovirus in a study on pediatric neutering were being housed in a long-term facility.

An effective, comprehensive shelter disease plan must consider some of these factors: number and types of animals received, different modes of disease transmission, shelter design, sanitation measures, stress levels, staff and volunteer training, role of public in transmission disease (factor that most of other veterinary facilities do not have to contend), detailed information specific infectious disease, sanitation, shelter design, foster care, spay/neuter, euthanasia programs (Miller, 2004).

There are lots of other infectious agents targeting dogs and cats in shelter environments. The goal of this section is to give brief explanations about pathogeny, epidemiology, diagnostic and individual and herd health treatment of the most common diseases in shelter. Diagnostic testing is important at the moment of animal admission in the shelter for a properly segregation and isolation, in order to prevent an infectious disease outbreak. In the end, vaccination strategies are part of a health program plan to minimize the spread of diverse infections within a herd and maintain the health of the individuals.

4.1. Physical examinations and selection of animals

Physical examinations (PE) should be performed as soon as animals arrive at shelter. Information about medical history may be missing and without the benefit of a clinical laboratory data, establishment of a definitive diagnosis for future health is not possible, so PE takes additional importance in shelter animals. It is important to have a designated area where a shelter can receive the animals and to identify and segregate animals with injuries that need immediate medical attention and separate those with infectious disease symptoms. Routinely placing those into quarantine without PE first jeopardize the health of other animals (Miller, 2004). Information about how to perform a basic and an efficient physical

examination on shelter animals is described in Appendix 6 and is based on Dr. Appel lectures presentation (Appel, 2005).

4.2. Infectious diseases of dogs and cats

It is beyond the scope of this dissertation to offer specific information about all the diseases that can occur in the shelter. The common diseases are mentioned and only the most prevalent will be discussed and reviewed. Other information is easily found in other clinical texts.

The following information about common infectious diseases profile is retrieved from UC Davis Koret Shelter Medicine Program information sheets (www.sheltermedicine.com), unless other sources are indicated.

4.2.1. Respiratory disease

Respiratory disease represents the most prevalent, visible and difficult to manage infectious problem in shelters. In cats and dogs the major syndromes are upper respiratory tract infection and kennel cough. These diseases are typically due to infectious agents while lower respiratory disease occurs as infectious exacerbation of noninfectious medical problems or due to extension of primary respiratory pathogens (Foley & Bannasch, 2004, p. 235)

- **Feline Upper Respiratory Infections**

Agents listed below can be a primary cause of URI. Approximately 80-90% of cases are thought to be caused by one of the two viruses listed.

- Feline Herpesvirus-1 (FHV-1 - probably the most common)
- Feline Calicivirus (FCV - perhaps not as common as herpes, but potentially more severe)
- *Chlamydomphila felis*
- *Mycoplasma spp.*
- *Bordetella bronchiseptica*

All the pathogens listed can also be found in clinically healthy cats.

Mode of transmission: is very easily spread by fomites or droplet transmission, and some URI agents are resistant to disinfection. Factors such as overcrowding, poor air quality, poor sanitation, stress, concurrent illness, parasitism, poor nutrition, and other causes of immunosuppression predispose to disease, and many of these factors are difficult or impossible to completely eliminate in a typical shelter, cattery or rescue home.

Clinical signs: cats showing any one of these signs (Figure 8) should be suspected of having URI and should at minimum be isolated from the general population:

- Clear or colored nasal discharge
- Sneezing
- Red/inflamed conjunctiva
- Ulcers/sores on the nose, lips, tongue or gums
- Fever/lethargy/loss of appetite (these may be signs of many other diseases as well)



Figure 8 – Clinical signs of URI in cats, caused by feline herpesvirus (on the left) and caused by calicivirus (on the right), (Newbury, 2007)

Diagnosis: Most often, a causative agent is not identified in individual cases of URI and the diagnosis is based on clinical signs:

- FHV-1 is more likely to cause keratitis or corneal ulceration;
- FCV is more likely to be associated with oral ulceration or limping;
- *Chlamydomphila* and *Mycoplasma* more often seen with conjunctivitis without other signs.

However, all can cause overlapping signs of URI and be isolated from clinically normal cats. Nevertheless, there are circumstances under which laboratory diagnostics have value. Diagnostic options include viral and bacterial culture and PCR on conjunctival or oropharyngeal swabs. Samples should be obtained from the most prominently affected location. Some circumstances under which diagnostic testing should be considered:

Prevention: URI can never be totally eradicated, the frequency and severity of cases can be greatly reduced through a systematic management strategy. Reduction of overcrowding, effective cleaning, adequate ventilation, stress control, and good preventive medicine are the cornerstones of URI control in feline populations. Vaccination does not prevent infection or development of a carrier state for any URI pathogen, and many strains of FCV are vaccine resistant. Vaccination reduces severity and duration of disease. Vaccines should be given immediately upon shelter entry for best effect. Modified live (MLV) parenteral vaccines are available containing feline herpesvirus, feline calicivirus and feline panleukopenia (FVRCP).

Isolation: Many cats shed URI pathogens without showing clinical signs, hence the need for careful hygienic precautions even when handling apparently healthy cats. Cats with active

signs of infection are likely to be shedding much greater amounts, and isolation of these cats from the general population is a requirement for even a minimal disease control program. Many cats are still shedding increased amounts for a few weeks following recovery. Although not always practical, ideally these cats will not be mixed directly back into the general population, or at least not with vulnerable populations such as kittens or recent arrivals.

Disinfection: Most URI pathogens survive in the environment no more than a few hours (FHV-1) to a few weeks (*Bordetella*) and are inactivated by routinely used disinfectants. FCV is an exception, and may survive for up to a month or even longer in dried discharge. FCV is inactivated by household bleach (5% sodium hypochlorite) diluted at 1:32, or by potassium peroxymonosulfate.

Treatment: see 4.7.

- **Canine Kennel Cough Complex**

It is common to use the term “kennel cough”, “infectious tracheobronchitis” and variations on “canine infectious respiratory disease complex” interchangeably. It is a complicated syndrome by still unraveling agents.

Etiology: Viral pathogens associated with upper respiratory disease in dogs include: Parainfluenza; Adenovirus; Canine respiratory coronavirus (distinct from canine enteric coronavirus); Canine herpesvirus (Canine distemper and canine influenza may also be associated with upper respiratory signs). Bacterial pathogens implicated in CIRDC include: *Bordetella bronchiseptica*; *Mycoplasma spp.* *Streptococcus zooepidemicus* (may cause severe systemic disease). Secondary bacterial invaders of many species may a synergistic role in causing more severe disease in some dogs. Several of the pathogens listed are insufficient in themselves to cause disease without the additional stress, high contact present kenneling.

Signs: Clinical syndromes of Canine Infectious Respiratory Disease Complex (CIRDC) may include sneezing, nasal and ocular discharge (Figure 9), and sometimes lower respiratory and/or systemic disease.



Figure 9 – Nasal and ocular discharge are evident clinical signs of kennel cough (Newbury, 2007).

Mode of transmission: Transmitted by aerosolized micro droplets, fomites over moderate time/distance, direct contact. Agents present in primarily ocular, nasal and oral secretions.

Diagnosis: Virtually all pathogens listed cause a similar overall clinical presentation of coughing and/or nasal discharge. Therefore, the cause of CIRDC cannot be diagnosed based on clinical signs in a single dog. However, the pattern of affected animals (population) can at least provide some differential diagnostic. For example, canine distemper is unlikely to affect vaccinated dogs over four months of age and if other distinctive signs as neurologic signs are present, it is possible that other dogs showing mild disease are also affected with the same pathogen. Canine influenza, on the other hand, is likely to affect a high percentage of exposed dogs, regardless of age or vaccine status. Diagnostic test are warrant if a CIRDC occurs in a population with unusual frequency or severe or if there's as suspicion of zoonotic infection. PCR is used for viral detection of the most common viral pathogens. There may be false negatives considering that canine influenza may be missed because viral shedding occurs very early in course of disease (see canine influenza) and false positives occur following vaccination. Most of the pathogens associated with CIRDC can be isolated from clinically normal dogs. For definitive diagnosis, necropsy is the most powerful tool available, and should be utilized if possible whenever dogs die or are euthanized with suspected.

Prevention: Important strategies to accomplish canine infectious respiratory prevention include vaccination, stress reduction, and prevention of airway irritation (for example: by minimizing barking and cleaning in such a way that airborne irritants are reduced). The latter goal is accomplished through reduction of crowding, effective sanitation, and maintenance of good air quality.

Disinfection: Most CIRDC pathogens survive in the environment no more than a few hours (canine distemper) to a few weeks (*Bordetella*) and are inactivated by virtually all routinely used disinfectants. Adenovirus is an exception; like other un-enveloped viruses, it is reliably inactivated by only a handful of disinfectants, including household bleach (5% sodium hypochlorite) diluted at 1:32, or by potassium peroxymonosulfate (Trifectant®) (Eleareky, Potgieter, & Kennedy, 2002). Survival of primary and secondary pathogens may be greatly enhanced by persistent moisture in the environment; therefore surfaces should be in good repair to prevent pooling of water, and cleaning should be followed by thorough drying on a daily basis. The cleaning process itself may serve to spread, rather than prevent. Ideally dogs should be held in doubled sided runs separated by a guillotine door, such that the dog can be held on one side while the other side is cleaned. If dogs must be removed from their run for cleaning, they should not be left in a common holding kennel nor tied in aisleways while contaminated water and disinfectant is sprayed nearby. Disinfectant should be applied

via a sprayer or other application system rather than a mop and bucket which will quickly become contaminated.

Isolation: Prompt removal of all symptomatic animals, no matter how mild the signs, has been critical in resolving many outbreaks, because the severity of clinical signs is dictated as much by the dog's immune system as by the inherent virulence of the pathogen. A perky dog with a mildly nasal discharge may be shedding a pathogen such as canine distemper or influenza which could be fatal for another animal. Staff and volunteers should be trained to carefully scan for sneeze marks on kennel walls as well as observing dogs for clinical signs before walking, cleaning or otherwise interacting. Because airborne transmission of CIRDC is a possibility, ideally isolation areas should have separate air flow. However, if this cannot be achieved, facilities have managed to maintain effective isolation by providing at least 20 feet of physical distance between sick and healthy dogs and paying careful attention to fomite control. In a shelter, this could even be accomplished by maintaining 2-3 empty runs between an "isolation area" and a "general healthy population" area with some physical barrier.

- **Lower Respiratory Tract Infection**

Pneumonia is a severe sporadic condition in dogs and cats. Often the underlying cause is present such as preexisting URI, facilitating bacterial pneumonia or other causes may occur secondary to septicemia during parvovirus infection or ascarid migration. Diagnose is made if there are suspect signs like from cough (especially in cats) to elevated respiratory rate or dyspnea with or without mouth breathing, to depression and during physical examination with thoracic auscultation performed. Preventive management doesn't differ from the plan for kennel cough and URI (Foley & Bannasch, 2004)

Agents: that may cause a lower track infection: canine distemper, larva migrans and lungworms.

- **Canine Influenza**

Although not widely reported until late in 2005, canine influenza was first recognized outbreak occurred in racing greyhounds in Florida in January of 2004. Since its first appearance, canine influenza has been spreading steadily, and has now been found in animal shelters, throughout the United States. (Prudent precautions are the same as always for prevention of contagious respiratory disease in dogs UC Davis, 2007).

Agent: Canine influenza is an enveloped RNA virus, influenza A subtype H3N8 virus (AVMA, 2009).

Prevalence: Dogs are the only known susceptible species. Greyhounds are the only breed thus far reported to develop hemorrhagic pneumonia and acute death following infection. Healthy vaccinated dogs of all ages may be affected. Virtually 100% of dogs will become infected. However, up to ~ 20% will show no signs of disease. Therefore, all exposed dogs must be considered an infectious risk.

Clinical signs: The incubation period is 2-5 days. This represents a slightly shorter incubation period than is usually seen with other common causes of canine respiratory disease. In experimentally and naturally infected dogs, viral shedding ceases by 7 days post infection. This relatively short shedding period is typical of influenza infection. In most dogs, signs of infection are similar to “kennel cough” from other causes, and may include: mild low-grade fever; productive or dry cough lasting 10-30 days; unresponsive to antibiotics or antitussives; thick, purulent/mildly bloody nasal discharge.

Diagnosis: There is no way to distinguish canine influenza from respiratory disease caused by other infections based on clinical signs alone. Some factors which raise the suspicion of influenza include: vaccinated dogs affected (if a high percentage of well vaccinated dogs are severely affected, influenza is more likely and possibly less responsive to antibiotics. Serology is the most commonly used method to confirm infection.

Treatment: As for all viral diseases, treatment is largely supportive or when there is a secondary bacterial infection.

Prevention: The short shedding period and absence of a carrier state is helpful for shelters trying to minimize disease spread within the shelter and community.

Disinfection: Canine influenza persists < 1 week in the environment. It will be inactivated by most any commonly used disinfectant such as alcohol, bleach, quaternary ammonium compounds, and potassiumperoxymonosulfate (e.g. Trifectant ®) (UC Davis, 2007).

Prognosis: Fatality rate varies and is between 1-5%.

In May 2009, the USDA approved a vaccine intended as an aid in the control of disease associated with canine influenza virus infection (AVMA, 2009). The licensure of the first influenza vaccine for dogs was developed by Intervet/Schering Plough Animal Health Corporation. The canine influenza vaccine contains inactivated whole virus (United States Department of Agricultural - Animal Plant Health Inspection Service [USDA-APHIS], 2009).

4.2.2. Gastrointestinal disease

In shelters, the most common manifestation of gastrointestinal disease is vomiting and diarrhea. There are few primary pathogens but stress, diet change can also instigate diarrhea. The complicated etiology makes management difficult (Foley & Bannasch, 2004).

- **Feline Panleukopenia Virus**

Agent: Parvovirus closely related to canine parvo (unenveloped DNA virus).

Diagnostic aids: ELISA test for fecal antigen; CBC: leukopenia, especially neutropenia; In-house necropsy: segmental enteritis.

Test comments: Elisa: False positives are possible 5-12 days after MLV (modified live vaccine) vaccine (may be as early as 3 days with high antigen mass vaccine). Necropsy: Histopathology performed by commercial lab is gold standard.

Prevention: Vaccine available, subcutaneous or intranasal. Subcutaneous available as killed or modified live, with respiratory viruses or as single antigen. Efficacy of subcutaneous modified live is excellent. Vaccine is most beneficial if given immediately upon intake.

Mode of transmission: Highly contagious. Direct contact, fomite spread, mechanically spread by rodents and insects, can be aerosolized by high pressure sprayers. The virus is excreted in all body secretions during acute disease, but most often feces – shedding often precedes clinical signs.

Incubation: 3 -14 days (usually 5-7 days).

Post-recovery shedding: Maximum 6 weeks.

Disinfection: Thorough cleaning followed by bleach 1:32 or potassium peroxymonosulfate. No way to fully decontaminate unbleachable materials/organic matter such as grass or dirt yards.

- **Canine Parvovirus**

Agent: Canine parvovirus (unenveloped DNA virus).

Mode of transmission: Highly contagious. Parvovirus will be introduced into shelters from the surrounding community and can be spread on fomites (hands, feet, clothing and tools), rodents and flies traveling from kennel to kennel! Dogs may carry the virus on their fur and feet even if they don't get ill. The virus enters the dog through the nose or mouth and has an incubation period of usually 5-7 days.

Clinical signs: Affected dogs have mild to severe diarrhea, may be dehydrated and lethargic, have vomiting, or can develop severe to fatal secondary bacterial infections.

Diagnosis: There are three ways to "test" for parvo: clinical, by complete blood count (CBC), and by fecal antigen tests. Dogs with parvoviral enteritis have vomiting and diarrhea which typically is severe but may be mild. Lymph nodes may be enlarged and the dog may have a fever. Other diseases may mimic parvo, so a clinical diagnosis made without the aid of diagnostic testing is not precise. The fecal tests used in clinics and shelters are assaying for antigens of the virus itself. If the dog has the virus in its feces, the test should be positive.

Tests should be performed on any dog with diarrhea that is also exhibiting signs of systemic disease: vomiting, lethargy, fever, loss of appetite, dehydration, or dogs with unusually copious, smelly/bloody diarrhea, or any dog with known exposure to parvo within the preceding 14 days who then develops diarrhea.

Prevalence: Puppies under 6 months old are most likely to get severe disease. Rottweilers, Dobermans, Pit Bulls and mixes of these breeds are especially vulnerable. Adult dogs may get mild disease that is indistinguishable from diarrhea of any other cause.

Prevention: It is critical to prevent transmission of the disease and rapidly identify infected animals in order to provide medical care as deemed appropriate and protection to other dogs in the shelter. On the safe side, contaminated areas should be off limits to puppies for 1-6 months; the longer end of the waiting interval for moist, dark areas, and if area cannot be sprayed with potassium peroxymonosulfate. Vaccination against parvovirus is very effective and is the cornerstone of prevention and usually prevents disease in adult dogs that have received a vaccine at least 1-2 weeks before exposure, but does not prevent them from carrying virus on fur if exposed. Puppies up to 16 weeks of age may not be protected fully by vaccination.

Isolation: Puppies and at-risk dogs exposed to parvovirus should be isolated and quarantined for two weeks.

Disinfecting: incredibly durable in the environment, persists for months or years. Bleach or potassium peroxymonosulfate (Trifectant or Virkon-S) have been proven to kill parvovirus if used correctly but is resistant to ammonium quaternary and alcohol; Potassium peroxymonosulfate has relatively good activity in the face of organic matter, and can be sprayed on contaminated. There is no way to completely disinfect contaminated dirt and grass, although sunlight and drying has some effect. It

- **Canine Distemper Virus**

Agent: *Morbillivirus* (family Paramyxoviridae; enveloped RNA).

Mode of transmission: Highly contagious and is transmitted by aerosol, droplet and direct contact spread is most common. The virus is excreted in all body excretions (feces, urine, etc), but most abundant in respiratory secretions.

Clinical Signs: Fever spike 3-6 days post-infection, clinical signs 1-4 weeks post-infection (longer incubation more common). Clinical signs of distemper are often unapparent or mild. If one dog in a shelter develops full blown disease, it is likely that there have been other, unrecognized cases in exposed dogs. Clinical signs of upper or lower respiratory infection and gastrointestinal disease are non-specific; a diagnosis of distemper should not be made based on these signs alone. Clinical signs more suggestive of distemper but seen with less

frequency include neurological signs (may appear up to 3 months later with or without preceding signs), ocular signs and dermatological signs.

Diagnostic tests: IFA for viral antigen or inclusion bodies in cells from conjunctival scrape, urine sediment, buffy coat; PCR of nasal or ocular discharge.

Test comments: There is no really satisfactory test for diagnosing distemper ante-mortem.

Prevention: Vaccine is available. It provides rapid protection against infection; puppies exposed 4 hours after vaccination were protected in one study. Recombinant vaccine provides better protection in the face of maternal antibodies (puppies less than 16 weeks).

Disinfection: Routine disinfection is adequate. Susceptible to heat, drying and most common disinfectants

Treatment: No specific treatment. Treatment consists of supportive care, and may include: fluid support; nutritional support and anti-emetic therapy for vomiting and prolonged anorexia; nebulization and coupage (percussion therapy) for pneumonia; and antibiotics for secondary bacterial infection.

- **Canine Coronavirus**
- **Salmonellosis**
- ***Campylobacter spp.***
- **Nematodes associated with primary gastrointestinal disease**

Most nematodes are not associated with diarrhea and vomiting, either cause almost no signs or cause other forms of disease such pneumonia or anemia. Several primary pathogens in the intestines include *Trichuris vulpis* (whipworms) and *Strongyloides stercoralis* can cause a severe watery diarrhea, particularly in young dogs (Foley & Bannasch, 2004).

Hookworms (*Ancylostoma*, *Uncinaria*): The most common intestinal parasite of dogs in the U.S. The national shelter parasite study showed that 20% of shelter dogs were shedding hookworm eggs. (UC Davis, 2007).

Roundworms (*Toxacara*, *Toxascaris*): The national shelter parasite study showed that 15% of shelter dogs were shedding roundworms and more prevalent in puppies less than 6 months old. A study of shelter cats found that fully a third of cats were shedding roundworms. The clinical signs of roundworms infection may be somewhat less severe in kittens than puppies. Roundworms can be treated with pyrantel, piperazine, or fenbendazole (UC Davis).

Whipworms (*Trichuris vulpis*): The national shelter parasite study showed that 14.3% of shelter dogs were shedding whipworms. Whipworms are just as common in older dogs as they are in puppies (UC Davis) Whipworms spend their time in the GI epithelium of the dog

and have a prepatent period of about 3 months. Signs range from no signs to severe diarrhea with mucous and blood (Foley & Bannasch, 2004).

Tapeworms: The most common species of tapeworms in dogs and cats in North America is *Diplydium caninum*. Infection with this tapeworm is acquired by eating infected fleas. Infected animals may intermittently shed egg-containing worm segments (called 'proglottids') in their feces. The second most common type of tapeworm in dogs and cats are various *Taenia* species. Dogs and cats may become infected with these types of tapeworms by feeding on smaller mammals, such as mice or rabbits. There are also a few other kinds of tapeworms that are much less common, such as *Echinococcus*, *Diphyllobothrium* and *Spirometra*. Most tapeworm infections in dogs and cats are sub-clinical (i.e. they do not usually cause clinical signs, such as diarrhea). They do sometimes cause peri-anal irritation, resulting in an animal scooting its rear end along the ground. Heavy infections can sometimes result in abdominal pain, vomiting, weight loss, and possible intestinal blockage. However, several tapeworm species are zoonotic – they can also infect humans. The larval forms of *Echinococcus* tapeworms pose a serious zoonotic threat. Tapeworms are often diagnosed when proglottids are seen on the feces or near the anus of an animal. These proglottids resemble grains of rice. Praziquantel is the drug most commonly used to treat tapeworm infections in dogs and cats. Fenbendazole is effective against a few types of tapeworms. Eliminating and preventing fleas is also extremely important in controlling *Diplydium caninum* infections (UC Davis).

Strongyloides stercoralis: *Strongyloides stercoralis* infection in dogs may be asymptomatic, or may cause bronchopneumonia or severe diarrhea. *S. stercoralis* is potentially zoonotic, although transmission from dogs to humans is probably relatively rare. Nevertheless, the potential human health hazard should always be taken into account, and infected dogs should be handled with caution. *S. stercoralis* is diagnosed by observing larvae in fecal culture, and is typically treated with ivermectin (UC Davis).

4.2.3. Miscellaneous Pathogenic GI Flora

Giardia (multiple species): The prevalence of *Giardia* in shelter dogs and cats is probably underestimated. *Giardia* is potentially zoonotic, but the risk of humans contracting *Giardia* infection from dogs and cats is low. *Giardia* cysts are difficult to detect on fecal floats. Direct smears are about 50% sensitive for detecting *Giardia* in diarrheic fecal samples. The most sensitive method for diagnosis of *Giardia* in shelters is a SNAP ELISA test, but this test is not intended for screening of asymptomatic dogs. Vaccination for *Giardia* is available, but not recommended for use in shelters. *Giardia* can be treated with metronidazole, fenbendazole, or febantel (Drontal Plus) (UC Davis).

Coccidia (*Isospora spp.*): The national shelter canine parasite study showed that about 8% of shelter dogs less than 6 months old were shedding coccidian oocysts. Coccidia are less common in dogs over 1 year of age, and very uncommon in dogs over 7 years old. Drugs used to treat Coccidia include ponazuril (Marquis Paste), toltrazuril, and sulfadimethoxine (Albon). In shelters in which Coccidia is a common problem, prophylactic treatment of all puppies and kittens with ponazuril is recommended (UC Davis).

Toxoplasma: Exposure to this parasite is common in cats. Cats are the only “definitive” host, meaning that they are the only animals that can shed infective forms of the parasite (‘oocysts’) in their feces. Although previous exposure is common, it is quite uncommon for cats to be actively shedding because they develop immunity. Shedding is more likely in kittens and young cats. Cats typically become infected through exposure to the feces of other cats, or by eating undercooked meat or rodents. Toxoplasma infections are usually sub-clinical in cats; diarrhea is not generally seen. Exposure to toxoplasmosis is common in humans, with 30-40% of people having positive antibody titers. Most human Toxoplasma infections result from ingestion of undercooked meat, but humans may also become infected by ingestion of oocysts from soil contaminated with cat feces, usually following gardening or ingestion of raw vegetables from such soil, or through exposure to cat feces, usually when cleaning litter boxes. Therefore, screening cats through fecal floatation is recommended, especially for cats less than 1 year old, and for cats being introduced into group housing. Oocysts in fresh feces are not immediately infective; the oocysts require at least 24 hours. Therefore, removal of feces from litterboxes at least once daily, followed by proper disposal of feces, will reduce the risk of exposure. Toxoplasma oocysts are resistant to most disinfectants. Cleaning with scalding hot water or steam is most effective. Treatment of Toxoplasma infections should not be undertaken based solely on detection of Toxoplasma oocysts in the feces. Diarrhea in kittens or cats is much more likely to be due to other parasites or to other non-parasitic causes. Since most human infections with Toxoplasma are not transmitted by direct contact with cats or cat feces, the best prevention for the general public is to cook meat properly, wash vegetables thoroughly or peel before eating, and wear gloves when gardening (UC Davis).

4.2.4. Integumentary Infectious

- **Scabies**

Agent: *Sarcoptes scabiei var. canis* (burrowing mite).

Susceptible domestic species: Dogs, may transiently infect cats.

Diagnosis: Skin scrape; Diagnosis may be made on clinical signs of intensely pruritic skin disease with characteristic distribution and response to treatment, even if negative skin scrapings are obtained.

Mode of transmission: Direct contact, fomite transmission. Mites live off host up to 6 days at room temperature, longer (up to 21 days) in moist cool environment.

Disinfection: Environments that are not easily mechanically cleaned and disinfected (home-like environments) should be treated with an environmental pesticide.

Treatment: Live mites may remain after resolution of pruritus – continue treatment for 2 weeks past remission, at least 4-6 weeks.

- **Fleas**
- **Ticks**
- **Ear infections**
 - *Otodectes cynotis*
 - *Malassezia*
 - *Staphylococcus intermedius*
- **Dermatophytosis (Ringworm)**

Agent: *Microsporum canis* (other species can infect dogs and cats, but *M. canis* is by far most common in shelters.)

Diagnostic tests: Woods lamp has maximum accuracy when performed correctly (allow lamp to warm up 3-5 minutes, perform in completely dark room, hold over suspect lesion 3-5 minutes); Fungal culture; KOH direct smear is quite accurate when performed correctly. Microscopic identification is required for all cultures, regardless of presence or absence of color change on DTM. Some species, notably *Trichophyton*, can be more difficult to culture.

Mode of transmission: Present on hair, very readily shed in environment, extremely contagious, may be carried on hair and dust long distances on fomites and through heating and ventilation ducts.

Disinfection: Highly resistant can persist for over a year. Repeated applications of bleach at high concentration (1:10) and prolonged contact most practical method of inactivation, commercial steam cleaning for carpets. Some environments can't be decontaminated.

Post-recovery shedding: Cats can remain infectious for several weeks following clinical recovery. Cats can act as mechanical carriers without developing clinical signs themselves.

- *Malassezia*
- **Bacterial folliculitis and pyoderma**

4.2.5. Vector borne, bite transmitted and systemic diseases in shelters

- **Bartonellosis**
- **Tick Borne Diseases**
 - **Erlichiae and Rickettsie**
 - ***Babesia spp.***
 - **Lyme disease (*Borrelia burgdoferi*)**
- **Rabies**

4.2.6. Retroviruses

- **FeLV**

Agent: FeLV, or Feline leukemia virus (Retrovirus).

Prevalence: Kittens are at significantly higher risk for contracting the disease than adult cats.

Mode of transmission: a contagious most commonly spread via the saliva of infected cats, either directly or by contaminated fomites such as food and water dishes, FeLV can also be present in other secretions such as urine or feces, but this is less common. FeLV can be spread transplacentally from mother to offspring, but spread via nursing or grooming is more common. Airborne spread is not a concern.

Clinical signs: In addition to causing leukemia, it has been associated with various other types of cancer, anemia, and immune suppression leading to increased susceptibility to various infectious diseases FeLV infection can cause various types of cancer, especially lymphoma and, as the name implies, leukemia. It can also cause anemia and deficiencies of other blood cell lines, as well as causing general immunosuppression that makes the cat vulnerable to numerous infectious diseases.

Diagnosis: Blood tests are available for screening. The most commonly used test is the ELISA test, which looks for viral antigen (protein) in the blood. This is available as an in-house kit.

Prognosis: Although cats may clear initial infection, there is no cure for persistent infection and it is ultimately fatal. Acutely infected kittens may have several years of good quality life before developing signs of disease, and some individual cats may live much longer. However, 50% of infected cats living in multiple cat households will die within two years of contracting the disease, and that number increases to 80% after three years.

Treatment: Consists of good nourishment, protection from stress, and management of secondary conditions. There is no treatment that has been shown to be effective in curing FeLV infection.

Prevention: One of the most important factors in preventing FeLV is identification of positive cats and removal from the general population. This approach has greatly reduced the prevalence of this disease in most communities. If FeLV positive cats are to be maintained in a shelter environment, the following precautions should be taken: Clearly identify FeLV positive status on cage and paperwork; House in individual cage; House away from kittens and isolation wards where cats are more likely to be shedding infectious disease; Use separate dishes and toys, or clean dishes thoroughly after use with hot water and an effective disinfectant; Immediately clean all surfaces with which an FeLV positive cat had contact with an effective disinfectant; Wash hands after handling FeLV positive cats.

If FeLV positive cats are re-homed, adopters should be counseled to keep the cat strictly indoors, either isolated or in contact only with other FeLV positive cats.

Disinfection: FeLV is not very durable in the environment. It is inactivated by most commonly used disinfectants. It can survive for up to 48 hours in a moist environment at room temperature.

- **FIV**

Agent: Feline Immunodeficiency Virus (Retrovirus).

Prevalence: most commonly seen in intact adult male cats.

Transmission: FIV is not very readily spread. The main route of transmission is through bites that are relatively likely to occur when a cat is newly introduced into a group. Individually housed infected cats in a shelter do not pose an infectious risk to the shelter population. It is rarely spread through casual contact, and cats may cohabitate for years without transmitting the disease. Although transmission to kittens at or near the time of birth has been experimentally reported, it appears to be extremely uncommon. Kittens born to FIV positive mothers are at low risk for infection, although they may initially test positive due to the presence of maternal antibodies.

Disinfection: FIV is not very durable in the environment. It is inactivated by most commonly used disinfectants. It can survive for up to 48 hours in a moist environment at room temperature.

Diagnosis: Blood tests are available for screening for FIV in-house or at most laboratories. The most commonly used test is the ELISA test, which looks for viral antibodies in the blood.

Prognosis: infected with FIV and enjoy good quality of life for quite some time before developing “feline AIDS related complex” by the time they are 3-6 years old, developing a number of secondary conditions such as severe oral disease and various infectious conditions. There is no cure for FIV, and cats with this disease are vulnerable to a number of secondary infections due to a suppressed immune system. This is a fatal disease.

Treatment: consists of good nourishment, protection from stress and infectious disease, and management of secondary conditions. There is no cure for FIV infection, though the efficacy of various antiviral agents in treating the disease is an area of active research.

Prevention: Testing and removal or isolation of FIV infected cats has been an important part of reducing the overall frequency of this disease. If FIV positive cats are to be maintained in shelters, the following precautions should be taken: Cats should be housed individually; FIV positive status should be noted on the cage and on paperwork; for their own protection, FIV infected cats should be housed well away from kittens or sick cats, If placed for adoption or rescue, cats should be adopted only to households where the cat can be kept strictly indoors for life and isolated from all FIV negative cats. There is a vaccine available for FIV, although it is not 100% effective in preventing infection and FIV vaccinated cats will test positive for FIV on all currently available tests.

4.3. Non-infectious diseases in shelters

Shelter animals may need care for non-infectious diseases. There are innumerable ailments the animals are exposed to and there's a need for herd and individual health management for these diseases. The most obvious non-infectious and as a personal experience to most of shelter veterinarians doctors are:

4.3.1. Dirofilariosis

According to the American Heartworm Society (www.heartwormsociety.org), the heartworm, *Dirofilaria immitis*, is enzootic in dogs in the United States. Diagnostic tests for heartworm disease are usually included in the evaluation of dogs presented with respiratory insufficiency, chronic cough, and exercise intolerance.

Heartworm disease in cats is not as common as it is in dogs, but an increasing number of cases are reported each year. This increase is probably due either to heightened awareness/diagnosis, actual increased feline infection or both. Currently, infection with *D. immitis* is usually included in the differential diagnosis of cats with coughing, dyspnea, or intermittent vomit, the recently defined heartworm-associated respiratory disease (H.A.R.D.). Unlike in dogs, we cannot treat cats to eliminate their heartworm infection. We can only try to decrease clinical signs if they occur (Hurley, 2005).

4.3.2. Demodecosis

Demodex spp. are host specific mites that are normal inhabitants of the hair follicles in most species of domestic animals and man. Demodectic mites are indeed part of the normal fauna of canine and feline skin, where they are present in small numbers in many healthy

individuals. It was reported Demodex mite, different from *D. cati* and *D. gatoi* in an outbreak of alopecia, erythema, comedones, and variable pruritus was reported more recently in twenty cats in a shelter³. Infestation by *D. gatoi* (3 cats) and this new mite (6 other cats) was demonstrated. The new mite was found along hair shafts from clumps of easily epilated hairs and was longer (and wider) than *D. gatoi* but shorter than *D. cati*. Biopsies were taken from 7 cats and showed no mites, only a hypersensitivity reaction. Weekly lime sulfur rinses plus daily oral ivermectin (300 µg kg⁻¹) were successful (Newbury, Moriello, & Steinberg, 2006).

4.3.3. Nutritional deficiencies

4.3.4. A few more non-infectious concerns in the shelter

Further investigations on how to treat these conditions (Spindle, 2010) in small animal's populations are required, because these diseases are often seen in shelters:

- Skin issues (allergies, etc)
- Degenerative joint disease/dysplasia issues
- Urinary issues
- Metabolic issues requiring treatment (thyroid/diabetes, etc)
- Neoplasia
- Eye conditions
- Ear conditions
- Heart murmurs
- Seizure disorder

4.4. Overview of zoonotic diseases

An overview of some zoonotic diseases of importance in a shelter environment (disease) from UC Davis (n.d.) is listed in Appendix 4.

4.5. Epidemiology - disease statistics

Many shelters in the US do keep shelter statistics - although specific disease related statistics are not kept as often as those on euthanasia and adoption and death.

Shelters need to track the physical health status of animals on entry and then on exit, in order to determine what changes occur in the shelter (and distinguish from pre-existing conditions) and catch trend changes early.

The Pet Point website (<http://www.petpoint.com>) has some interesting statistics about some frequent diseases in shelters. These are numbers taken from shelters using the PetPoint and

Sheltercare insurance programs, might be interesting for some conclusions (**Erro! A origem da referência não foi encontrada.**).

4.6. Diagnostic testing – FeLV, FIV and Heartworm screening tests

FeLV Testing

The blood test itself is quite accurate, but not perfect. Because cats can be transiently infected, it is possible that a cat will initially test positive for FeLV, and then recover and test negative at a later date. At minimum, all positive ELISA tests should be repeated to ensure that correct technique was used (if whole blood was used for the initial test, it should be repeated on serum). The blood test may also falsely identify recently infected cats as negative. To be absolutely certain, cats must be tested 1-3 months after their last known exposure. False negatives are more common when samples other than blood (e.g. saliva, tears) are used and when multiple samples are pooled (UC Davis, n.d).

Cats testing positive by the ELISA test on serum should ideally be retested either using an ELISA test from a different manufacturer or by sending the appropriate sample for an IFA test at a diagnostic laboratory. If both tests are positive, the cat is very likely persistently infected. To be absolutely certain, cats can be held and retested after 30 days if resources are available and the cat can be appropriately housed and isolated. A PCR test can also be run to help resolve any conflicts in the tests. PCR is very sensitive, so a negative test result run by a reputable laboratory indicates infection is unlikely. Unlike FIV, testing for FeLV may be performed at any age. As mentioned, infection may take up to 1-3 months to develop, so results in young kittens are slightly less reliable. Samples should be tested individually; testing representatives from litters or pooling samples significantly decreases test accuracy (UC Davis).

FIV Testing

The FIV blood test is quite accurate, but false positives and occasionally false negatives do occur. The blood test may also falsely identify recently infected cats as negative. To be absolutely certain, cats must be tested 1-3 months after their last known exposure because even in adult cats infection may take up to 1-3 months to develop, so a final test should be performed 3 months after the last known exposure to be absolutely certain. The test cannot be accurately interpreted in young kittens because maternal antibodies may interfere with FIV testing in kittens. There is currently no test available to distinguish between infected cats and cats that have been vaccinated for FIV (UC Davis, 2007). However a new discriminant ELISA which can differentiate between these positive tests will hopefully be available soon (Levy, et al, 2008)

Each shelter must examine its resources to determine whether disease testing is a necessary part of a health program (Miller, 2004). If resources allow, cats testing positive by the ELISA test should be retested by sending the appropriate sample for IFA or western blot analysis. In high-volume shelters, holding cats for retesting may not always be practical. At the very least, the ELISA test should be repeated to ensure that correct technique was used. Samples should be tested individually, pooling samples significantly decreases test accuracy (UC Davis, 2007)

The Association of Shelter Veterinarians (ASV, n.d.) believes that in keeping with the guidelines provided by the American Association of Feline Practitioners (AAFP), the Feline Leukemia Virus (FeLV) and Feline Immunodeficiency Virus (FIV) status of every cat should be known. However, given the limited resources of many shelters, the fact that the overall incidence of both diseases is not very high in the general cat population, and that shelters typically do not experience outbreaks of these diseases, it may not be cost effective for high volume, high turnover shelters to screen every cat in the shelter before selection for adoption. Each shelter should determine the best method of informing adopters the dangers of these diseases and facilitate the administration of the test either before or at the point of adoption in the shelter, or coordinate efforts with outside veterinarians in the community. However, shelters that provide communal cat housing, treat infectious disease, neuter before adoption, and/or house animals long term should strongly consider FeLV and FIV screening tests to be an essential component of the health care program. Tests for feline leukemia virus in cats and heartworm tests in dogs are probably the most frequently used screening tests in animal shelters. Some shelters may also screen for feline immunodeficiency virus. Unfortunately, the tests for these (and most other diseases) are not 100% accurate, either in diseased or non-diseased animals. The imperfections in the performance of tests can result in animals being labeled falsely as diseased or disease free. This can result in unnecessary euthanasia (e.g., due to a false positive diagnosis) or the addition of an infectious cat to a colony of healthy animals (due to a false negative diagnosis (Scarlett, 2006)

No healthy cat should be diagnosed and euthanized for FeLV/FIV based on the results of a single positive test (Appel & Hart, 2004) without corroborating physical symptoms or adjunctive clinical laboratory testing (Miller, 2004).

The Association of Shelter Veterinarians (ASV, n.d) believes that in keeping with the guidelines provided by the AAFP, no owned pet should be euthanized based on the results of a single positive FeLV or FIV test. In shelters, however, the logistics and cost of holding and retesting unowned cats may be an ineffective use of resources. In order to avoid any misunderstandings, shelters whose policy it is to euthanize stray or unwanted animals based

on the results of a single positive test should make clear their understanding that while a small percentage of cats may test falsely positive, the euthanasia policy decision is designed to protect the overall health of the shelter population.

Heartworm testing

Heartworm testing may be conducted in areas where the disease is commonly encountered. Although Miller (2004) doesn't recommend for routine testing of all dogs, it is advised to test animals that may be in the shelter on a long-term legal hold before using medications that cause adverse effects in heartworm-positive animals and for adopted animals in cases in which the shelter is unable to treat heartworm positive animals.

4.7. Basic Parasite Control Protocol for shelters

Shelter's deworming program should be based on a knowledge of which parasites are present in the particular shelter population. However, there are some general guidelines that could apply to nearly all shelter populations (UC Davis, 2007).

The general recommendations, based on (Spindle & Makolinski, 2008) are:

- There is no ideal product that will safely and cheaply treat for all parasites; therefore, animals should be dewormed on intake with a product that covers the main zoonotic agents
- Animals with clinical signs should additionally receive individualized workup and treatment;
- It is strongly advised that all shelters provide written information explaining to adopters that adopted animals should have a physical examination and a stool sample checked by their regular veterinarian, soon after adoption to check for parasites.

UC Davis (2007) defined a basic parasitic control, as it follows.

A prophylactic treatment of all shelter dogs and cats for the most common parasites at the time of intake, should consist at least of a dewormer effective against roundworms and hookworms, and flea preventive (+ tick preventive for dogs). All of these parasites are common in dogs and cats, can potentially cause problems in people and environmental contamination (worm eggs or protozoan oocysts) since they are difficult to eradicate once it occurs. The most straightforward products to use for this basic internal and external parasite control protocol are an oral dewormer containing pyrantel pamoate (Strongid®) and topical products such as imidacloprid (Advantage) and/or fipronil (Frontline). In addition, puppies and kittens should also be dewormed repeatedly with pyrantel every 2-3 weeks between the ages of 2 week and 3-4 months of age. Re-treatment is very important. Pregnant and

nursing dogs and cats should also be dewormed with pyrantel every 2 weeks while housed in the shelter or foster care; For all other adult dogs and cats, a second dose of pyrantel is recommended 2-3 weeks after intake, if still in the shelter.

4.8. Other Treatment protocols

Considering that the most prevalent diseases in the shelter environment are upper respiratory infections and gastro-intestinal diseases. This section will provide herd management and individual treatment for the most probable diagnosis for these diseases clinical signs. The financial constraints that shelters endure, frequently leads to an empirical treatment. This is based on evident clinical signs, since diagnostic testing and laboratory work is often unavailable.

4.8.1. Treatment of feline upper respiratory infections in an animal shelter

The information is based on (UC Davis, n.d.), unless other sources are indicated.

Prevention must be the most important of population URI management but treatment is an important component of URI management, for the population as well as the individual cat. Treatment itself is associated with risks and costs, especially in a shelter. With any treatment that involves handling and manipulation of cats, the risk of spreading disease is increased. The decision tree included in Appendix 7, reflects an assumption that cats are being treated for URI with the intention of continuing treatment until the cat recovers and is placed for adoption.

When selecting cats to place on treatment, adoptability must be considered. It does not make sense to invest large amounts of time and energy if they are unlikely to be adopted. At minimum, cats should be tested for FeLV/FIV prior to initiating treatment for URI.

The two most common causes of feline URI, accounting for 80-90% of cases, are feline herpes virus and feline calicivirus. Less commonly, bacterial species may be the primary cause, including *Chlamydomphila*, *Mycoplasma*, and *Bordetella*. Cats with primary viral URI may also suffer from secondary bacterial infection. By definition, the signs of infection with any one of the possible agents of URI are similar. All can cause sneezing and ocular and nasal irritation and discharge, and definitive diagnosis is generally impractical in a shelter setting, although some agents cause other specific signs. Initial treatment should be based on the most likely cause of the observed signs, and this is the basis for the recommendations. Antibacterial agents are inappropriate when evidence of a bacterial infection is lacking. However, under some shelter conditions virtually all cats progress from clear nasal or ocular discharge and sneezing (categories 1 or 2) to more severe signs

suggesting possible bacterial involvement (categories 3-5). In this case, it may be better to pre-emptively treat all affected cats with appropriate antibiotics as soon as any symptoms are noted. This is most often the case when treatment rooms are overcrowded, ventilation is poor and husbandry problems are occurring. If most or all cats progress to requiring antibiotic treatment, diagnostic testing should be performed to determine whether an unusual pathogen is present. If primarily herpes or a mix of the common pathogens is detected, attention should be paid to improving the husbandry factors described above.

According to Spindle & Makolinski (2008), each cat should have a brief physical exam performed daily by vet staff to evaluate progress:

- i. At 7 day isolation point, if improvement is noted, treatment may continue;
- ii. At 7 day isolation point, if cat is unresponsive, different treatment may be tried;
- iii. At 14 day isolation point, if cat is unresponsive, cat may be euthanized or. Treatment may continue up to 4 weeks as long as improvement is noted;
- v. Cats that require extensive supportive care (IV catheter, force feeding) may be euthanized;
- vi. Cats that have been through treatment and relapse after returning to adoption will generally not go through a second course of therapy;
- vii. Foster homes may be sought for cats in feline quarantine;
- viii. There is a maximum of 2 rooms available for quarantine and a balance must be maintained with the adoption population. If this capacity is exceeded and foster homes are not an option, cats may be euthanized.

4.8.2. Treatment of Canine Infectious Tracheobronchitis (Kennel Cough)

The information is based on UC Davis (2007), unless other sources are indicated.

For dogs in the shelter environment of a shelter, antibiotic treatment is often indicated, since bacteria is most responsible. Doxycycline and potentiated sulfas are relatively good empirical choices when *Bordetella* infection is suspected, although resistance is possible. *Bordetella* is always resistant to Cephalexin. Note that *Bordetella* is not the only bacterial pathogen that may be involved, as either a primary or secondary pathogen. For secondary infections subsequent to canine influenza or other viral infections, on the other hand, cephalexin, fluoroquinolones, Clavamox® or other broad spectrum antibiotics have been found more effective than doxycycline.

Culture and sensitivity is indicated in an outbreak or an individual dog that fails to respond to empirical therapy. Orally administered prednisone had been recommended to reduce the severity of symptoms; while this may be beneficial if constant coughing is it has not been found to shorten the course of illness (Ford, 2005). For dogs unresponsive to oral or

parenteral antibiotics, nebulization with aerosol/non-absorbable antibiotics (e.g. gentamycin, polymyxin) may be beneficial. Other supportive care should include minimizing barking and walking on harness or gentle leader to avoid pressure on the trachea. There is no evidence that antitussive or expectorants are beneficial to reduce kennel cough symptoms in dogs; based on a study of Paul, I.M., et al. (2004) as cited in UC Davis, 2007). Narcotic antitussives are specifically *not* recommended because they can decrease respiratory function. Treatments with questionable benefit drugs should be avoided in a population setting because of possible side effects.

4.8.3. Gastro-Intestinal Upset management in dogs and cats

The following information is a brief review of Foley & Bannasch (2004)

Efficient testing for gastrointestinal (GI) disease in shelters can be difficult because of the primary pathogens agents that may cause no clinical signs in the animals, in addition to the laborious and expensive tests for these pathogens. Inappetance and diarrhea can also be caused by the changes in diet and stress and may be indistinguishable from true clinical disease. A shelter specific profile of diagnostic tests should be developed for surveillance. A common profile applied to diarrheic animals at least includes parvovirus testing. Evaluation of parasites through fecal tests as microscopic examination of smeared fresh feces, flotation and ELISA are very useful and may be the less expensive comparing to other diagnostic tests as PCR, bacterial culture and toxin identification and so on.

Prevention is the key to a far less expensive and traumatic for the animal than the treatment. Herd management of GI is based on surveillance and this should include a regular quantification of how much GI disease is present in the shelter as well as how many cases are diagnosis for example, parvovirus, whipworms, and so on. Data should be analyzed and recorded so final conclusions towards modifications on husbandry protocols can be made for an effective prevention. The following are important considerations to take into account:

- Animals can best resist GI infections when they are healthy and well nourished, not stressed and have been appropriately vaccinated.
- Incoming animals are a new way to introduce disease.
- There are highly susceptible breeds (such as Rottweillers for parvovirus).
- Highly susceptible animals because of age and changes in diet.
- Even if vaccination is performed for all incoming animals, vaccines don't address most of the GI pathogens (available vaccines for GI pathogens include parvovirus, coronavirus and Giardia) Puppies and kittens may not be protected due to maternal antibody interference and immunologic immaturity. No dogs or cats will be protected for the first week or so after vaccination is performed.

- It is important to limit transmission of GI pathogens, ensuring that susceptible animals are not exposed. The cages and shelter structure should be cleaned in a way that infectious agents do not persist: for GI pathogens, except *T. gondii*, requires for disinfection bleach diluted 1 part 32 parts of water.
- Routine worming of dogs as they enter shelter can help prevent significant contamination of the soil (see basic parasitic treatment).
- Keeping animal numbers low and density as possible are key to block transmission; control movement to keep potentially infectious and susceptible animals from having any contact with each other.
- If animals tend to stay for a long period of time, weeks or months in isolation, the managers and medical personnel should reevaluate whether such animals are receiving appropriate treatment or should be euthanized.

Individual animal management GI disease is based on shelter resources to treat ill animals that are limited. Nevertheless, decisions to treat, adopt out sick, or euthanize depend on the transmissibility of each agent, the prognosis and the potential adoptability of the animal. Additionally, empirical treatment is chosen when individual animals may have abnormal GI signs but specific diagnostic tests are not run. For GI empirical treatment, the veterinarians often include: antibiotics, motility modulators, bland diet, anti-inflammatory and soothing agents. Apparently these may improve the clinical disease but there has some drawback to take into considerations, for example, the use of antibiotics may adversely affect the bacterial normal flora particularly important in an animal with viral enteritis or even the use of a bland diet can be counterproductive if the animal won't eat. This emphasizes the importance that before treatment or euthanasia is initiated, to confirm the diagnosis.

Treatment for parvovirus includes nursing care, management of hydration and electrolyte status, prevention and management of secondary bacterial infections and septicemia due to the loss of white blood cells. A good mainstay antibiotic combination would be penicillin and aminoglycoside (only in a well-hydrated cat). Animals may also need force-feeding with warmed palatable food. In case of parvovirus many shelter euthanize the infected animals while others consider treatment. The rationale for treatment is that the mortality for a previous well and while receiving excellent nursing care is 50 percent. But with respect to treatment, the following should also be considered: treatment requires a lot of resources which might better be employed in prevention and infected animals can contaminate an environment, even after they appear to be recovered, so if any doubt that shelter can completely isolate the affected animals (foster homes or areas) it is irresponsible to initiate treatment, according to the author. Not all cats or dogs survive no matter how well treated, so if despite

progressive care, the animal appears to be unresponsive or does not improve within a few days there must be provisions for euthanasia and necropsy.

Other GI infections may have a better prognosis if identified and treated properly. Treatment of many parasitic infestations is straightforward and is covered along section 4.7 of the dissertation. Treatment for bacterial diseases depends on whether the bacteria are primary pathogens (*Salmonella*, *Campylobacter*).

4.9. Vaccination strategies in shelters

A well designed vaccine program can be a life saving tool to keep shelter animals healthy (UC Davis, n.d.), but according to Miller (2004), the role of vaccines in shelter health programs is poorly understood. Some vaccines provide protection and can drastically reduce the frequency of life-threatening disease in the shelter. Other vaccines, while less impressive, can reduce the frequency and severity of disease within the shelter and after release to adopters or rescue group (UC Davis).

There are some obstacles to successful immunization in a shelter, for example, the lag time between vaccination and successful immune response may be 2-7 days, stress delays, modified live vaccines that induce viral shedding illness in debilitated animals and intranasal vaccines that cause faster immune response but may produce mild clinical symptoms (Ellis, et al., 2001); Vaccines minimize overall disease as demonstrated by studies showing the confirmation of how important they are when protocols are appropriately developed and applied. Edinboro et al (1999) as cited in Miller (2004) yielded interesting results in a clinical trial of intranasal and subcutaneous vaccines to prevent URI. In this study 90 apparently healthy cats that were admitted with no history of vaccination were 18 times more likely to develop URI. The use of a bivalent intranasal vaccine (calici and herpes) in addition to subcutaneous vaccination (panleukopenia, herpes and calici) resulted in a 76 percent reduction in the overall risk of developing URI.

Shelters are unique environments that different vaccine protocols from those used in small animal practice are now recommended by experts. The American Animal Hospital Association (AAHA) and American Association of Feline Practitioners (AAFP) have developed specific panel guidelines that shelter professionals can refer to. Although these documents provide reference guidelines, no single protocol works in every situation, and strategies that weigh risks and benefits to individuals and populations are still important (Spindle & Makolinski, 2008). The guidelines are intended to educate and inform the profession and help veterinarians make vaccine recommendations for individual dogs or, in the case of a shelter, a population of dogs (American Animal Hospital Association [AAHA], 2006). A vaccine program can be implemented once the level of disease is understood and it

depends on the prevalent diseases in the area, population characteristics (e.g. low *versus* high turnover, animal control versus adoption facility, mostly owner surrendered versus mostly stray animals) and shelter resources and philosophy (UC Davis, n.d.)

Core Vaccines for dogs in shelters

- Distemper (CDV)
- Adenovirus-2 (CAV-2/hepatitis)
- Parvovirus (CPV)
- Parainfluenza (CPiV)
- Bordetella bronchiseptica

The first four antigens are often grouped into one vaccination (DA2PP or DHPP) administered by a single injection given under the dog's skin (subcutaneously/ SQ.). Puppies should be vaccinated starting at 4-6 weeks of age and revaccinated every 2-4 weeks until 16-18 weeks of age (earlier end of age range and shorter interval when infectious disease risk is high). Adult dogs should be vaccinated once at intake or if in poor health should receive a second vaccination 2-4 weeks later after intake. Vaccines for Bordetella bronchiseptica are available with or without canine parainfluenza and canine adenovirus-2 (UC Davis, n.d.)

The 2006 AAHA Canine Vaccine Guidelines are available in their entirety on the AAHA Web site (AAHA, 2006), they include detailed recommendations on the use of available vaccines, which are classified as core (vaccines that all dogs should receive), noncore (vaccines that are optional and should be administered based on animal's geographic and lifestyle exposure), or not recommended. According to UC Davis, limiting vaccines to core components reduces cost and incidence of adverse reactions.

Some of the core vaccination recommendations for dogs entering or residing in animal shelter environment, are slightly more aggressive than the guidelines presented for general veterinary practice, for example, animals should be vaccinated at short end of the suggested intervals. The antigens that offer significant protection against common and severe infectious diseases should be used. Following adoption, adopters should discuss with the veterinarian a tailored vaccination program (UC Davis).

The vaccines not recommended are for diseases that not represent a significant threat to the population of dogs or have clinical efficacy against clinical disease (AAHA, 2006) and these are:

- Canine coronavirus.

- Giardia

Vaccines for diseases which pose minimal infectious risk within the shelter are generally not indicated until after adoption, when the dog's individual risk profile can be assessed, and these are:

- Leptospirosis
- Lyme disease

In general, it is recommended to vaccinate animals as soon as possible at time of admission to all dogs older than 6 weeks (4 weeks in cases of disease outbreaks), because delaying vaccination may increase risk of infection subsequent to exposure (AAHA, 2006; Ellis, Krakowka, Dayton, & Konoby, 2002)); to vaccinate every animal (with few exceptions such as fractious/feral, severely ill, +/-pregnant) and to use modified live vaccines (Spindle & Makolinski, 2008). Other recommendations for specific cases in the shelter environment are: there is no compelling reason to administer vaccines to an individual dog at the time of admission to a shelter if clear documentation of vaccination is provided; for dogs held long term in shelter, AAHA recommends that these dogs should be inoculated with all the recommended vaccines, plus rabies vaccine and when it is the decision of the facility to initiate the "initial series"(puppy shots) to individuals animals that will be held long, then the recommended vaccines should be administrated at 2 week interval, rather than 3-4 week, until the animal reaches the age of 16 weeks; pregnant dogs should be vaccinated upon admission with CDV, parvovirus, and intranasal *B. bronchiseptica*. If available inactivated, subunit, recombinant, polysaccharide conjugate vaccines should be selected for pregnant dogs – the guidelines task force extrapolated from the human field where no evidence exists of risk from vaccinating pregnant women with inactivated viral or bacterial vaccine or toxoids and the benefits of vaccinating outweigh the potential risks when disease exposure is high; for sick dogs the decision to administer or delay vaccination because of current illness depends on the severity of symptoms and etiology, therefore, vaccination with CDV, parvovirus, and *B. bronchiseptica* is advised upon admission for dogs with mild illness or injuries (diarrhea, mild URI with or without fever) – recognizing that these dogs are at high risk for developing severe infections superimposed on the current clinical problem (AAHA, 2006)

Intranasal vaccination is recommended due to the demonstrated rapid onset of immunity (3-5 days) and the potential benefits of local IgA derived protection. Additionally, this vaccine can be used in puppies as young as 2-3 weeks of age, and may provide local immunity even in the face of maternal antibody (AAHA, 2006). Another study (Ellis, et al., 2001) in dogs, demonstrated the similar that the administration of *B. bronchiseptica* vaccines in sequence

by injectable and intranasal route is more efficacious in protection puppies against bacterial colonization, inflammatory changes in the respiratory track and resultant clinical disease than vaccines administered by either route alone.

Core vaccines for cats in shelters

- Feline herpesvirus-1 (feline viral rhinotracheitis/FHV-1)
- Feline calicivirus (FCV)
- Feline panleukopenia (FPV)

Feline vaccinations are usually grouped into one vaccination (FVRCP).

Kittens should be vaccinated starting at 4-6 weeks of age and revaccinated every 2-4 weeks until 18 weeks of age (earlier end of age range and shorter interval when infectious disease risk is high). Adult cats should be vaccinated once at intake. If poor health, prevented an optimal response to the vaccine given on intake, a second vaccination 2-4 weeks later may be beneficial (UC Davis, n.d.)

The 2006 AAFP (American Association of Feline Practitioners) guidelines for vaccination in shelters and multiple cat environments are available on the AAFP website (AAFP, 2006). In general for shelter environments, however, it is advisable to vaccinate most kittens and cats regardless of physical condition. If the cat's immune system is so weakened that a modified-live agent vaccine will induce disease, exposure to the wide variety of infectious pathogens present in most shelters will likely result in death of the cat. In general, if a cat cannot be safely vaccinated, it cannot safely remain in an animal shelter. Injured or ill cats should then be revaccinated when healthy. Modified live subcutaneous vaccination is generally recommended (UC Davis, n.d.) because modified live vaccines take less time to induce immunity in animals (Spindle & Makolinski, 2008).

According to AAFP guidelines:

- Feline parvovirus vaccines should be considered as core vaccines in shelters. Kittens should be vaccinated beginning at 4 weeks of age during an outbreak and at 6 weeks of age otherwise, every two weeks (minimum interval) as long as they remain in the environment or until 16 weeks (Dawson S, et al., 2001 as cited in AAFP, 2006).
- Feline herpesvirus-1 and feline calicivirus vaccines should be considered as core vaccines in shelters. Intranasal vaccination in addition to vaccines for injectable administration may be preferable in high-risk shelters to induce a more rapid immune response in potentially naïve cats. Cats vaccinated against FHV-1 are significantly less likely to shed virus than unvaccinated cats, which may improve population health (Binns & Dawson, 2000 as cited in

AAFP, 2006). Vaccination against FCV does not prevent infection or shedding but may mitigate severity of signs. As with FHV-1 vaccination, the benefit of reduced disease severity may lead to increased adoptions and community support (AAFP).

Queens in which the vaccination status is not adequate or that have a prior history of infection with FHV-1 or FCV may receive booster vaccines prior to breeding or parturition to maximize delivery of maternal antibodies to kittens (Lawler & Evans, 1997 as cited in AAFP, 2006), in example catteries with endemic URI. If vaccination is determined to be essential, use of killed agent vaccines may be preferable and should use intranasal administration in kittens (Figure_Apx 2, in Appendice 8). Cats with acute illness, debilitation, or high fevers should not be vaccinated. However, in shelters in which delaying vaccination may lead to increased susceptibility to infection, vaccination in the face of illness may be indicated. Vaccination of cats in shelters with injuries or mild to moderate illness (such as URI or dermatophytosis) with FPV, FHV-1, and FCV is advised on admission. Vaccination with severe disease should ideally be delayed

- In shelter environments, cats destined to be group housed with other cats should be appropriately tested for FeLV and FIV prior to inclusion (Levy, et al., 2001 as cited in AAFP, 2006). They should be housed separately from uninfected cats and sent off-site for more appropriate care (such as spaying or neutering) as soon as possible. Because of their high risk of exposure, FIV- and FeLV infected cats should receive killed FPV, FHV-1, and FCV vaccines when maintained in a shelter. FeLV vaccination is generally not recommended in shelters in which cats are individually housed because of the low risk of viral transmission. In such shelters, resources are generally better spent on testing, and the decision to vaccinate is best left to the adopter based on the cat's risk profile. In facilities in which cats are group-housed, such as in some shelters and foster homes, FeLV vaccination is recommended.

FIV vaccination is not generally recommended because of the low risk of FIV transmission in typical single-cat housing, and FIV vaccines are thus considered as noncore vaccines. According to Dr. Miguel Carreira (personal communication, 2010) FIV vaccine has a low efficacy of 60-70%. Resources of time and money are generally better spent on testing prior to cohousing, like with FeLV the decision to vaccinate is best left to the adopter

Clients should be informed that FIV vaccinated cats will develop false-positive FIV test results and the decision to vaccinate should be reached only after careful consideration of this implication.

Cat vaccines occasionally recommended should be reserved only for shelters in which infection has been confirmed by laboratory diagnostics and/or very suspicious clinical signs (UC Davis, n.d.).

- *Chlamydophila felis* (*C. psittici*): The efficacy of the vaccine is low, disease is generally infrequent and adverse reactions may be relatively common (UC Davis). Vaccination is considered noncore in shelters; however, vaccination may be considered as in environments in which disease caused by *C. felis* infection has been confirmed. If used, the need for this vaccine should be reassessed periodically (AAFP, 2006).
- *Bordetella bronchiseptica*: Vaccination does not have proven benefit in shelters and may cause mild signs of URI Bannasch MJ, Foley JE. (UC Davis n.d.). The association between *B bronchiseptica* infection and URI in shelter and rescue cats is not clear; results of one study (Bins, et al. 1991 as cited in AAFP, 2006) indicate that a significant association was found, whereas results of another study (Bannasch & Foley, 2005 as cited in AAFP, 2006) indicate that there was no increased risk of URI associated with infection. Vaccination in shelters is considered noncore but may be warranted if *B bronchiseptica* infection is confirmed (AAFP, 2006).

Rabies for dogs and cats

It recommended either on intake or exit from the shelter (AAHA, 2006; AAFP, 2006). It is important to follow state legal requirements for age, administration and appropriate revaccination schedule. Kittens and puppies usually receive at 12 - 16 weeks. Booster given in one year and then every 1- 3 year vaccination recommended. There are some vaccines that must be given annually (Spindle & Makolinski, 2008).

Proper locations of vaccine injections, according to UC Davis (n.d.):

Dogs:

- DA2PP – (Canine Distemper, Hepatitis, Parvovirus, Parainfluenza):

All subcutaneous vaccines should be given in the subcutaneous space between the shoulder blades (Spindle & Makolinski), or right shoulder.

- Rabies – Right rear leg

Cats:

According to the guidelines from the American Association of Feline Practitioners, all vaccines given as far down on the limb as possible:

- FVRCP (Feline Rhinotracheitis (herpes), Calicivirus, Panleukopenia)- Right shoulder
- Rabies - Right rear leg
- FeLV - Left rear leg

SECTION 5

Shelter and community programs

In order to deal effectively with pet overpopulation and promote health and welfare of animals in both shelters and community a variety of programs have appeared. Trends in shelter behavior programs have been accompanied by the arrival of a rising number of adolescent animals with behavior problems, being necessary not only to evaluate the animals in the shelter, but to help prevent relinquishment. Behavior and foster programs should be considered essential for any shelter trying to reduce its euthanasia numbers and raise staff morale (Miller & Zawistowski, 2004).

5.1. Population management within the shelter and in the community

5.1.1. Spay and Neuter

Spaying and neutering of shelter animals should be viewed as part of the basic wellness Program (Spindle & Makolinski, 2008). Shelters recognize that widespread sterilization of a community's animals often decreases their shelter intake and they often play a vital role in coordinating spay/neuter services for targeted animal populations within a given location (Spindle & Makolinski).

The Association of Shelter Veterinarians Spay-Neuter Task Force developed a consist of recommendations for preoperative care, anesthetic management, surgical care, and postoperative care and are based on current principles of anesthesiology, critical care medicine, microbiology, and surgical practice, as determined by means of reviews of the scientific literature and expert opinion (Association of Shelter Veterinarians Task Force, 2008); however, task force declined to address the issue of adequate postoperative analgesia in the days following these elective surgeries.

The following information is based on Appel & Hart (2004), unless other sources are indicated.

The term spay refers to the surgical procedure of ovariohysterectomy and the term neuter refers to either surgical procedures of ovariohysterectomy or orchidectomy, although most of the time is used to the surgical procedure of castration. In this text neuter refers to male castration. A young animal is defined as an animal between 6 months and 6 years of age.

A critical step in trying to alleviate the overpopulation problem is, achieved through providing surgical spay and neuter services for animals in shelters. Ideally, all animals should be altered prior to adoption, with few exceptions, because it decreases the need for follow-up by the shelter, guarantees that adopters are in compliance and also sets a great example for the community. Situations involving animals that will be placed for adoption, neutering is best performed (as early as 6 weeks) to ensure compliance, because being sexually intact has been identified as the leading risk factor for owner relinquishment of cats and dogs (ASV Task Force, 2008). The main reasons for neutering are it aids in decreasing pet overpopulation but also reduces medical problems in the animal's future, and gives the animal a greater chance of being adopted (Spindle & Makolinski, 2008).

There are special considerations for surgery in the shelter situation:

- The patients should be selected (ASV Task Force, 2008) healthy, adoptable, sexually intact, adult and pediatric animals. Animals with serious medical conditions or behavior problems are not good candidates for adoption and should not be sterilized unless they are going to be placed in a home. For all cases a complete medical and surgical record should be completed and maintained.

- It is necessary to have a preoperative evaluation based on a physical examination on the day of the surgery. An inability to perform a basic blood work out (as it should be a gold standard) on healthy young animals shouldn't be a reason to not spay or neuter animals, when thousands of animals are safely spayed and neutered without its benefits. As part of the physical examination, because animal health history sometimes is unknown, all patients should be evaluated for previous spay/neuter surgeries. Female patients (dogs and cats) should be shaved along the ventrum to check for a spay scar, prior to anesthesia and surgery (the shave spot must include the umbilicus cranially and should extend to the distal third of the abdomen). The veterinarian must also examine the external genitalia and mammary glands, palpate the *linea alba* looking for other signs that the female has already been altered. If an animal has a scar, but also has a prominent vulva or mammary tissue and nipples and if the physical examination is not conclusive, the authors advise an abdominal exploratory based on the fact that is better than leaving an animal intact. It is important not only to prevent the overpopulation problem, but also to prevent mammary tumors. In males, palpation of both testicles must be done with evaluation of secondary characteristics.

- ASV Task Force and the authors recommend food should be withheld from all animals for an appropriate period prior to surgery; however, ASV notes withholding water is neither necessary nor recommended for pediatric animals (i.e., animals between 6 and 16 weeks old), a small meal should be fed 2 to 4 hours before surgery, and food should not be withheld for > 4 hours before surgery. For juvenile (i.e., animals > 16 weeks old) and adult animals,

food should be withheld for a minimum of 4 hours, but withholding food for > 6 hours is not warranted.

- Special considerations for certain common shelter medical problems as URI are taken into account. These problems should not prevent the animal from being spayed/neutered, although it is not ideal to anesthetize and perform surgery on an animal with URI; it can be done safely and is a necessity in the shelter situation. According to the authors' personal experience, cats with fever as high as 106°F have been successfully spayed/neutered while providing supportive care. These cats most often recover well from both surgery and the URI, and ultimately are more adoptable than an unaltered cat with a URI. ASV Task force agree some conditions (URI, parasite infestation or subclinical heartworm disease) may theoretically increase the risk of anesthetic complications or the risk of transmitting infectious diseases to other animals, but the benefits of neutering likely outweigh these risks in the setting of a spay-neuter program.

- The surgical suite to perform surgeries should be a clean room, with little traffic to help maintain sterility and this room should be maintained for surgery only and the door kept shut all the times. If conditions are questionable perioperative antibiotics as cefazolin (22mg/kg IV) or ampicilin trihydrate (22 mg/kg SQ) are good choices. The shelter should have all the equipment and emergency drugs as would be found in any typical surgery setup.

- There are many acceptable anesthetic protocols. The authors use the anesthetic protocol listed in Appendix 8. As spay and neuter procedures are painful, analgesics should be included in the anesthetic plan. The authors believe that post operative analgesia is appropriate for spays, but not usually necessary for most routine castrations as the procedure is short and analgesia administered in the preoperative period should be still be effective.

- Intravenous catheterization is ideal in case of emergency, but not absolutely necessary in these patients either.

- Protective eye lubricant should always be placed in both eyes at the time of anesthetic induction to prevent corneal injury.

- Patient monitoring devices such an ECG, pulse oximetry should be used if available. As is often the case in shelters, there is little technical support to assist the veterinarian. If the surgeon is alone, there should be both a visual and auditory means of monitoring patient, for example, an ECG machine, to give information about patient status during anesthesia.

- After patient is anesthetized, urinary bladder should be completely emptied by manual expression; fur carefully clipped to avoid skin irritation because the animal is much more likely to bother the incision and the skin is then aseptically prepared in a standard manner.

Some surgeons prefer to spay a cat through a flank incision. The author considers approach acceptable and is the surgeon's preference. While the patient is being prepped for surgery,

the surgeon should perform a surgical scrub of hands and forearms with antimicrobial soaps as povidone-iodine or chlorhexidine. Surgical cap and masks plus sterile surgical and plus sterile surgical attire are recommended. The patient is draped (Figure 10) with sterile quarter towels and/or large barrier drape for all surgeries with exception cat castrations.

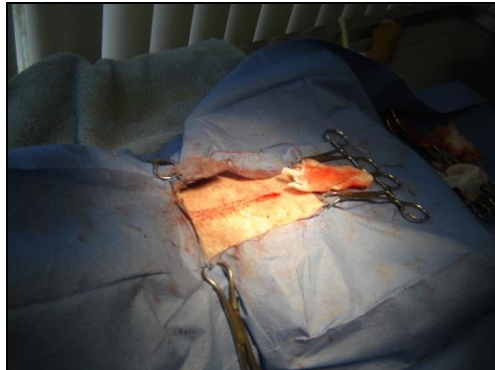


Figure 10 – Patient draped in a routine spay surgery at Humane Society of Plainfield.

There are many variations of ovariectomy and castrations. The surgical technique should be the most comfortable for the surgeon. Sterility must be maintained and new surgical gloves and new surgical pack should be used for each patient.

For postoperative instructions, the authors advise that all patients should be fed and offered water once they are alert in the evening of the surgery day. The incision should be monitored for signs of heat, pain, swelling, discharge or odor; the animal should be kept quiet for 10-14 days (for abdominal surgery) or 7 days (for castration) and there are no sutures to remove.

The immediate postoperative period, patients should be monitored for signs of pain, if an increased heart and respiratory rates), restlessness and vocalization. Additional analgesics should be administered using the same analgesic and dosage given as a pre-medication. Antibiotics are not administered after surgery unless a break in sterile technique occurred.

Controversy surrounds the decision as to whether or not provide patients with anti-inflammatory/analgesic medications. Some say the animals will recover faster others believe that mild discomfort reminds the patient to remain quiet, because too much activity can lead to a dehiscence of the *linea alba*.

5.1.2. Pediatric spay/neuter

Based on Appel & Hart (2004) many veterinarians spay and neuter animals before they reach puberty, so long term health risks present at 10 weeks is also present at 6 months, since both ages are prepuberal. The definitive advantages, besides helping stem pet-overpopulation, the surgery is faster, easier, less expensive, few perioperative complications, recovery and healing times are shorter.

Many controversies and concerns have risen about pediatric spay/neuter. However, most of these concerns have not been verified by scientific research. The concept of pediatric spay/neuter is currently supported by AVMA and ASV.

The ASV (n.d.) supports early-age (6 to 16 weeks) to spay/neuter dogs and cats. The association notes that owned pets may be best served by scheduling surgery at 4 months of age or older to allow time for the development of immunity through vaccination.

Neutering prior to sexual maturity is strongly recommended to prevent the unintended litters and animals that will be placed for adoption, neutering is best performed prior to adoption (as early as 6 weeks of age) to ensure compliance because neutering prior to adoption is likely to improve the odds that adopted animals will be retained in their new homes. Being sexually intact has been identified as the leading risk factor for owner relinquishment of cats and dogs (New et al., 2000).

Numerous controlled prospective and retrospective studies have been performed to evaluate the effects of early age spay-neuter.

- Kustriz (2002), an early spay-neuter (puppies or kittens 6 to 14 weeks of age) clinical consideration is the animals should be fasted no more than 3 to 4 hours before surgery to prevent hypoglycemia; and no significant short-term or long-term effects have been reported.
- Howe et al. (2000), asserts prepuberal (less than 24 weeks old) gonadectomy in cats compared with traditional-age (> or = 24 weeks old) did not result in an increase incidence of infectious disease, behavioral problems, or problems associated with any body system during a median follow-up period of 37 months. Additionally, the rate of retention was the same for cats that underwent prepuberal gonadectomy as those that underwent traditional-age gonadectomy.
- Howe et al. (2001), asserts prepuberal (less than 24 weeks old) gonadectomy in dogs compared with traditional-age (> or = 24 weeks old) did not result in an increase incidence of infectious disease, behavioral problems, or problems associated with any body system during a median follow-up period of 48 months. Additionally, the rate of retention was the same for dogs that underwent prepuberal gonadectomy as those that underwent traditional-age gonadectomy; Infectious diseases, however, were, more common in dogs that underwent prepuberal gonadectomy.
- Howe (1997) notes prepuberal gonadectomy did not increase morbidity or mortality on a short-term basis, compared with gonadectomy performed on animals at traditional age.
- Spain, Scarlett, & Houpt (2004) evaluate the long term risks and benefits of early-age gonadectomy compared with traditional-age gonadectomy, and early-age appears to offer more benefits than risks for male dogs; for female dogs however increased the urinary

incontinence suggesting that delaying gonadectomy until least 3 months of age may be beneficial.

Data from these studies suggests that early age spay-neuter is not associated with serious health problems and is a medically sound procedure. ASV states that early age spay-neuter offers many advantages including safe anesthetic and surgical techniques, shorter surgical and recovery times, and avoidance of the stresses and costs associated with spaying while in heat, pregnant or with pyometra. There are also numerous long-term health benefits including virtual elimination of the risk of mammary and testicular tumors. Finally, in addition to benefiting the individual patient, early age spay/neuter helps veterinarians to fight the single largest killer of dogs and cats: overpopulation and euthanasia of unwanted, homeless pets.

Although spay/neuter is an important part of effective population control programs, and may benefit individual dogs and cats if performed at the appropriate time, whether and when to spay/neuter specific animals requires the application of science and professional judgment to ensure the best outcome for veterinary patients and their owners. Prevention of unexpected litters; reduced incidences of some cancers and reproductive diseases; and prevention and amelioration of certain undesirable behaviors have been documented as benefits to spaying/neutering dogs and cats. However, potential health problems associated with spaying and neutering have also been identified, including an increased risk of prostatic cancer in males; increased risks of bone cancer and hip dysplasia in large-breed dogs associated with sterilization before maturity; and increased incidences of obesity, diabetes, urinary tract infections, urinary incontinence, and hypothyroidism (Sanborn, 2007).

Anesthesia is not a risk if performed by someone experienced with pediatrics. It would be probably better to wait for female puppies to be slightly older in private practice to limit chances of hormonal sphincter incompetence (Spain, 2004). In a shelter setting, remaining in an environment where potentially could contract disease animals or spaying means leaving a shelter and finding a home, then probably is better to spay at an early-age. ASV task force also notes for owned pets may be best served scheduling surgery at 4 months of age or older to allow time for the development of immunity through vaccinations.

Appel & Hart (2004, table 22.3, table 22.4) uses the anesthetic protocol for pediatric canine and feline ovariohysterectomy and castration, described in Appendix 8.

5.2. Development of animal recover programs

5.2.1. Behavior Programs

The demographics of the animals admitted by shelters changed and became clear that adolescent and adult animals now constitute the most significant proportion of dogs and cats relinquished to animal shelters (Salman, 2000). Additional analysis by Salman (2000) indicates that behavior problems with companion animals constitute one of the most significant reasons for relinquishment.

Given the context that animals in the shelters are likely to have behavior problems, there has been a trend to develop programs that evaluate the problems animals may present, provide enrichment and rehabilitation when possible and offer support services following placement in new homes (Reid, Goldman, & Zawistowski, 2004).

5.2.2. Shelter medicine behavioral assessment

One of the most daunting challenges faced by shelter workers is to assess a temperament of an animal and try to modify in order of a successful adoption.

Temperament or “personality” is to be the result of an interaction between genetic influence and environmental persuasions (Goodloe, 1996, as cited in Reid, Goldman, & Zawistowski, 2004). Temperament can only be assessed through an examination of the animal’s behavioral characteristics. And a summary of the animal’s temperament is generated from the animal’s reaction during testing assessment. The purpose of assessing dogs in a shelter setting, according to Ferguson (2003) is to determine ‘adoptability’ ; determine whether the dog is a public safety risk and determine whether something can be done to improve adoptability

The reliability and validity of behavior tests are controversial as decision criteria for classification of shelter animals as unadoptable. Ferguson (2003) notes that dogs reach social maturity at 2-3 years of age and their ‘personality’ is not fully developed until then. So, behavior and temperament is influenced by experience and genetics. In a shelter or test situation, personality characteristics such as sociability, anxiety, trust, and ‘trainability’ may be falsely increased or decreased due to elevated stress levels. Depending evaluator skills could occur behavior misinterpretations. Stress may reveal ‘bad’ aspects of personality/temperament which is valuable information, but does not allow expression of true temperament.

It is important to know how to assess dog body language to accurately assess dogs and keep evaluators safe also.

Aggression is one of the leading behavioral causes of relinquishment to shelters, and therefore must be seriously evaluated before a dog is placed for adoption. A shelter or humane society is 'responsible' for the dogs it adopts out to the public. Therefore, shelters must thoroughly review the conditions (if available- dog's history, detailed information about the bite incident, and severity of the bite) when deciding whether to put a dog (with a bite history) up for adoption. Many shelters will not place a dog up for adoption if it has bitten someone. Because much of the aforementioned information is often not available, behavioral assessment is a very important tool in assessing the adoption candidate's aggressive tendencies (Ferguson, 2003).

Current evaluations exist but vary tremendously in complexity, examples are:

- SAFER (Safety Assessment for Evaluation Rehoming) test is a scientifically verified method of assessing aggression and potential for aggression developed by Emily Weis, PhD, the ASPCA's senior director of shelter behavior programs). Is probably the simplest, as it consists of five items and requires approximately 10 minutes administering (Reid et al., 2004). Animals are presented with a series of stimuli to determine how they behave in each situation (Stare test, sensitivity test, tag test, pinch test, food aggression, dog-dog aggression). The tests provide shelter staff with valuable information about the animal's temperament, which can then be used to develop behavior modification plans, if necessary.
- Sue Sternberg's tests: sociability, dominance, hug, play, prey drive, food bowl aggression, possession aggression, mental sensitivity, stranger aggression, child aggression, dog aggression (Ferguson, 2003).
- Amy Marder's tests are significantly more intensive, as it consists of 142 items and requires between one and a half to two hours to administer (Marder, 2002 as cited in Reid et al., 2004)

In the end, Ferguson (2003) emphasizes behavioral assessment techniques should be used scientifically (in order to gain valid information over time) and in conjunction with surrendering owner information, information from kennel staff, volunteers, etc., in order to achieve the most thorough assessment possible.

5.2.3. Foster Care

The following information is based on Sinclair (2004), unless other sources are indicated.

Foster care programs play a crucial supplemental role to the mission of an animal agency shelter. Foster care, it is important for agencies that do not have physical facility or to increase the likelihood of adoption of some animals they shelter, but don't have adequate isolation facilities. The program will address that deficiency by removing animals with mild infectious diseases to minimize transmission as well as orphaned, injured or immunostressed animals from the shelter environments.

There are different methods of providing veterinary care for animals in foster care programs. Including offering in-house care with a staff veterinarians and/or allow foster caregivers to seek veterinary care. The benefits of a well administered foster care program are the improvement the agency's relationship with the general public, agency is able to offer animals that are healthier and more "adoptable" and in the end, may improve the overall health of shelter's population by isolating animals that are sick or susceptible to illness (puppies and kittens). The caregiver candidates should be selected by a formal application, providing information about themselves, for example, identification, adequate facilities for the type of animals the candidate has applied for and submit an assessment of their own animal companions. The information about the health status of the animal's caregiver and the foster animals is important as a measure of protection of the animals involved from infectious diseases or behavior problems.

Foster care candidates should be carefully advised and trained on supplies needed, medical knowledge of zoonotic diseases, infectious diseases and both direct and fomite transmission occur, how to train foster animals, what disease and behavioral conditions are to be expected, what the usual course of treatment and prognosis.

Caregivers should be matched with a foster animal that fits their interest, abilities and housing capabilities. Then, regular monitoring and examination are crucial to a program's success, to verify that the animal is still in caregiver's possession, whether appropriate care is being provided and whether the condition for which he is being treated is progressively improving.

Types of other foster care programs:

- Cross fostering occurs when foster mothers (queens or bitches) accept orphan newborns kittens and puppies. This is the best solution but it is imperative foster families should be aware of infectious diseases and sanitation protocols (Miller & Zawistowski, 2004, p. 82);
- long term foster care situation for palliative care, which is meant to ease the end of life for an animal with a terminal disease.

5.3. Welfare and Euthanasia

The Association of Shelter Veterinarians (2010) recognizes that there are thousands of animal shelters, humane societies, rescue groups, sanctuaries that regardless of their purpose, at some point it will be necessary to euthanize an animal.

Animals euthanized are not just homeless offspring, disowned or displaced companions, but also victims of animal cruelty (animal fighting victims bred for aggressive tendencies and cannot be rehabilitated), feral and hoarded animals unsocialized; animals who are injured and debilitated that treatment is prohibitively costly and unlikely to relieve their suffering (Sinclair, 2004). Even when shelter community makes progress in finding ways to reduce euthanasia numbers, must continue debate, discuss and research the methods by which it will intentionally end lives of a subgroups of animals in shelter.

Criteria for euthanasia decisions are important to agree upon and to clearly document which animals are euthanasia candidates. In a community working to increase live release rate overall; steps need to be taken to establish consistency in language and reporting (Spindle & Makolinski, 2008). The Asilomar Accords were created in order to facilitate the data collection process and assure consistent reporting across agencies (see definitions on section 2).

Euthanasia criteria must be adapted to the organization and how these are developed and implemented varies. Once criteria are developed, it is crucial to be accepted and implemented by all organization members. Because there are so many possible circumstances that may apply to any individual animal, criteria should be flexible (Sinclair, 2004).

Staff training and support surrounding euthanasia is critical (Spindle & Makolinski, 2008)

It is imperative that each animal be provided with a humane and dignified death by personnel who have received appropriate training from a veterinarian or through a duly authorized or state approved program. Staff should be periodically reevaluated for their proficiency, and provided with grief and compassion fatigue counseling (ASV, 2010).

Euthanasia of animals in an animal shelter setting is different from euthanasia of owned animals, and this population deserve best quality of death veterinarians can offer, nevertheless, shelter euthanasia is the research of methods, equipment and drugs is desperately needed (Sinclair, 2004).

The ASV believes that euthanasia should be performed with an intravenous or intraperitoneal injection of sodium pentobarbital. The use of pre-euthanasia drugs to calm frightened or dangerous animals is strongly recommended. Intracardiac injections are acceptable only when it has been reliably verified that the animal is unconscious (i.e., lack of deep pain / toe withdrawal reflex). Verification of death by at least two methods is imperative. Appropriate

record keeping and safeguarding of the drugs and equipment should be undertaken in accordance with regulations.

In addition to those methods deemed unacceptable by the American Veterinary Medical Association (AVMA) 2007 Guidelines on Euthanasia (http://www.avma.org/issues/animal_welfare/euthanasia.pdf), the ASV believes carbon monoxide and carbon dioxide to be inhumane methods of euthanizing companion animals. Shelters that are utilizing these and other unacceptable methods are strongly encouraged to convert to euthanasia by injection of sodium pentobarbital as soon as training, drugs, and equipment can be acquired.

SECTION 6

Animal Cruelty

Animal shelters operate near the extremes of human-animal interaction, encountering the best and the worst of human behavior. The veterinarians will inevitably deal with medical aspects of various forms of abuse, ranging from deliberate cruelty to unintentional neglect (Patronek, 2004). Neglect, abuse and cruelty are legal terms for which there is not a uniform set of definitions (Reisman, 2004). In addition to unnecessary torture, suffering or death, definitions of cruelty may include failure to provide adequate food, water, or medical care, improper confinement or transportation, animal abandonment and animal fighting, and many other categories of prohibited behavior (Hurley, 2008). Signs suggestive of non-accidental injury include (Munro, 2001, p. 435 as cited in Hurley, 2008):

- Unexplained injuries or varying explanation for the same injury by different parties or over time;
- More than one fracture of differing ages in the same animal;
- Unexplained old rib fractures;
- A history inconsistent with injury
- A previous history of unexplained death or injury in another pet

Hurley (2008) also defines animal hoarding as: More than the typical number of companion animals; Inability to provide even minimal standards of nutrition, sanitation, shelter, and veterinary care, with this neglect often resulting in starvation, illness, and death; Denial of the inability to provide this minimum care and the impact of that failure on the animals, the household, and human occupants of the dwelling. Veterinarians with a reputation for being sympathetic to shelters and rescue groups are likely to eventually encounter well meaning individuals who have crossed the line into hoarding behavior. Laws regarding neglect, failure to provide adequate care, food, shelter, etc. often apply in these cases.

The site www.pet-abuse.com provides information and a current database of criminal animal cruelty cases

The Chart 1 demonstrates the percentages of the types of abuse crimes, being neglect the most common type of abuse (Figure 11).

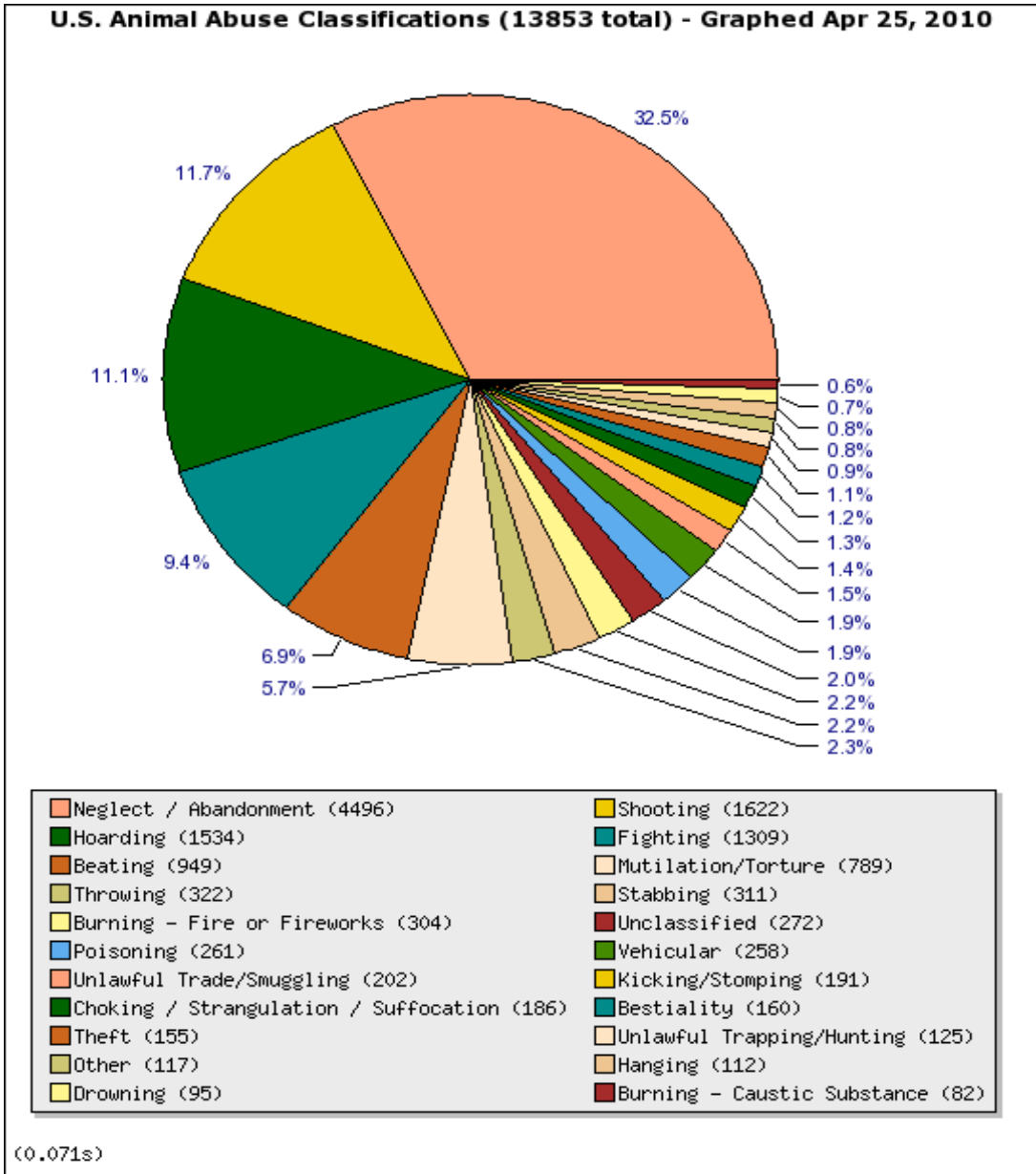


Chart 1 - Abuse classification and percentages, from Pet-Abuse.com and the AARDAS project (2010).



Figure 11 – Neglect - an example of passive cruelty, an act of omission (from Pet-Abuse.com)

Abused animals presented to a shelter may include a surprising variety of domestic, wild and exotic species, as (from Pet-Abuse.Com and the AARDAS project) shows:

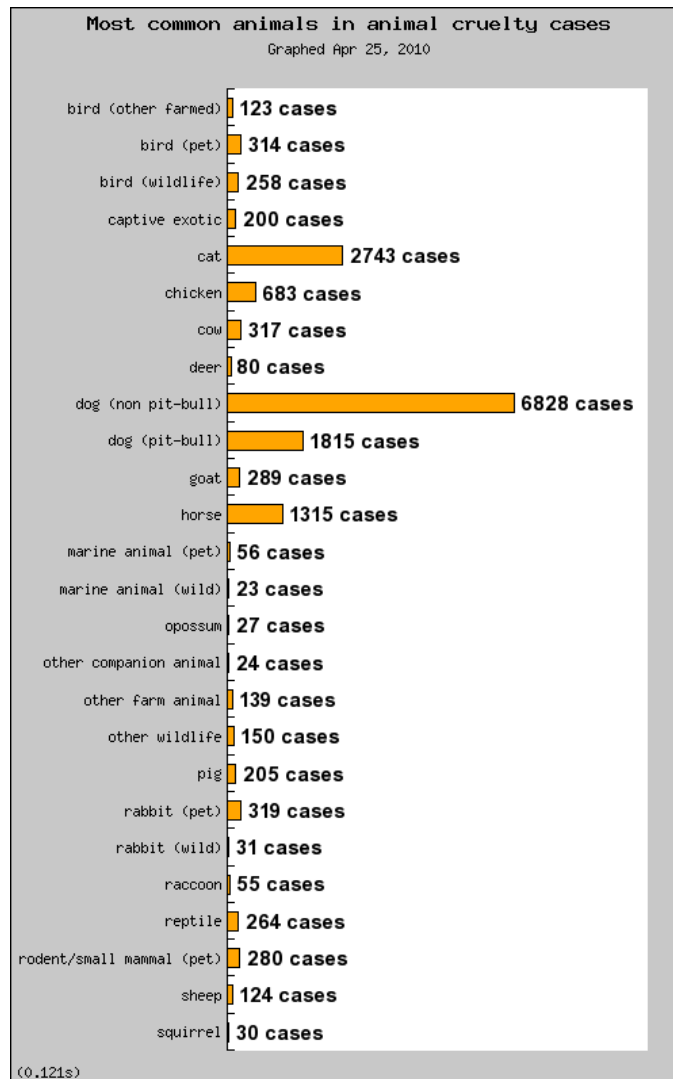


Chart 2 - Animal by Cruelty Type. This graph will illustrate the most common animals. The statistics represented here reflect animals connected to particular crime types, and in some cases the animal was not a victim of that particular cruelty type.

From a regulatory perspective, shelter veterinarians work in an environment of a complex web of regulatory laws (Patronek, 2004). In addition whether a case is prosecuted is not determined by veterinarians, but by law enforcement individuals.

It is beyond the purpose of this section to describe the regulatory laws (municipal, federal, state) that veterinarians in the USA, need to know. Animal cruelty statutes exist in all 50 states, but legal definitions of cruelty vary. Although there are federal animal welfare statutes, there is no federal animal cruelty law per se. A listing of some state animal cruelty laws can be found at <http://www.animal-law.org/statutes/index.html>, although this website may not

include all related laws. Local police, humane or sheltering organizations may be able to provide more specific details for the laws in a given locality (Kate Hurley). The local and state police are generally mandated to enforce all laws in the state. The information about cruelty laws can be consulted on ASPCA website (<http://www.asPCA.org/fight-animal-cruelty/lobby-for-animals/state-animal-cruelty-laws>)

According to Hurley (2008), veterinarians are required to report suspected animal abuse, and are protected from liability when making such a report. They can help protect themselves by becoming familiar with local laws, and veterinarians expecting to have extensive involvement with animal cruelty cases should also be familiar with laws of evidence, search and seizure and other related laws regarding citizen's rights. The AVMA PLIT³ recommends consulting an attorney if in doubt about the legality of any action with respect to an animal control case. It may also be helpful to have a second veterinary opinion when recommending action in a cruelty case, especially if making the recommendation for humane euthanasia.

Information about animal cruelty and the veterinarian's role in prevention has expanded tremendously in recent years. A veterinarian is one member of a team of professionals involved in assisting in an investigation of alleged animal cruelty, abuse, and/or neglect, and a successful veterinary evaluation of an animal victim of abuse is procedural (Reisman, 2004). The veterinarian plays a critical role in performing a complete and thorough forensic examination and will have to become expert in the collection and documentation of evidence suitable for presentation in a court of law (Patronek, 2004).

Good necropsy skills in general will serve veterinarians well, just as a good physical exam is the same whether veterinarians are examining a cruelty victim or a patient with any other medical complaint. Reisman (2004) notes that the veterinarians's goals in examining a live animal suspected of being victim of abuse or neglect are:

- accurate identification of the animal victim
- documentation of the animal's medical condition upon initial presentation;
- documentation of the animal's medical condition during treatment and recovery;
- statement of medical findings;
- preparation of the animal for adoption to a new home; in addition to medical care, an ongoing evaluation of their behavior is important.

Currently the field of veterinary forensic, which is defined by Reisman (2004), as the application of veterinary medical knowledge to the legal determination of whether an animal's

³ Offers professional liability protection AVMA members.

pain and distress has been caused by a person's cruel, abusive, or neglected behavior, is its infancy and there are no training programs and the professional literature is almost non-existent. The author emphasizes many lives will be saved in the process by successful prosecution of animal abuse cases, because the same individuals frequently are responsible for animal and child abuse, domestic violence, elder abuse and abuse of disable individuals.

Part II

1. Introduction

After presenting, in general, what shelter medicine involves as a specialty for teaching, research and clinic practice, in this section is presented my experience as an extern, relating to what is observed in the rescue shelter practical life in light of previous findings made by others researchers.

The data collected is qualitative. It was obtained by registering the number of animals seen and treated, observations made during the daily routine procedures and interviews to the doctors, animal care staff including veterinary technicians and HSP members and volunteers. The limitations of the proposed research, besides the natural language barrier and adaptations to veterinary medicine practiced in a foreign country, consists of the number of animals analyzed that is justified by time constraint and the number and type of medical procedures justified by financial constraint. Nevertheless, the early development stage of shelter medicine creates some difficulties in finding the correct standards and procedures recommendations to be applied to the type of shelter where the research was done. Being an extern of shelter medicine, is a very time consuming when you use the free time to practice spay-neuter surgeries, considering the major advantage to get the shelter animals ready for adoption and consequently reducing the incidence of developing disease. Although the main priority is being a shelter doctor, I could assist the doctors consulting the client's animals, although the number is low. It was a complement for developing skills in other areas of veterinary medicine.

It is important to refer that Illinois State Law affects Shelter Operations with laws regulating animal shelters, these also require a license to operate and in which animal shelters are inspected.

2. Animal Care Center, Humane Society of Plainfield and their functions

The following information is based on personal communications with Charles McKinney, an HSP volunteer, unless other sources are indicated.

2.1.ACC and HSP

Animal Care Center of Plainfield is a high volume practice open 7 days a week. It is also home of the Humane Society of Plainfield which also operates Mallard Point Veterinary Clinic, Plainfield Veterinary Clinic (not at the present time), and Oswego Animal Hospital in Illinois State, USA.

The link between A.C.C and HSP creates a shelter operate hospital with a dynamic caseload that is open to the public in addition to providing health care to shelter animals. A.C.C. and H.S.P are combined in one facility; ACC provides the kennel staff, shelter veterinarian specialist's doctors and housing to H.S.P. animals. The HSP besides helping animals to get a new home can also provide new future clients to A.C.C., considering the normal patient follow up after the adoption process. HSP sponsors an Illinois Department of Agriculture Humane Investigator, who investigates cruelty complaints. Also contracts with Will County and Joliet Township Animal Control to help reduce the kill rate of animals locally. HSP funding came mainly from private funding, for example, fund raisings or donations.

2.2.HSP mission, philosophy and statistics

HSP is a licensed shelter by Department of Agriculture of State of Illinois, USA. It is considered to be a private shelter with limited admission (no-kill); animals that were admitted came from: other Humane Societies sometimes from other States like Indiana State; rescued by a team of HSP volunteers from municipal shelters in the Midwest and from Animal Control officers that picked up strays and housed them in HSP (these were called "impounds"). It is against the law for a private agency to take in strays. Strays animals admitted to shelter with animal control responsibility, were held for 7-10 days, in accordance with legal holding period.

HSP does not accept surrenders of animals not previously adopted from HSP. The rescue mission is to save the lives of animals who are about to die at animal controls and kill shelters. HSP only accepts returns of animals previously adopted from HSP.

There are no age restrictions on admitted animals and adoptability is defined based on HSP's resources; HSP stated that they didn't euthanize any animal for overcrowding (instead they prevented it by limiting animal's admission) or for being in shelter for a long period of

time before adoption. Although striving to reduce the numbers of animals they euthanize the reasons of euthanasia that I personally assisted were health (terminal diseases) or behavior problems. To all adopted animals under 6 months of age, offers training and behavioral counseling to assist in the transition of adopted animals into new homes.

HSP keep a record of the number of the animal's intake, euthanized, returned and transferred. These records, by shelter regulation state law (Ill. Adm. Code tit. 8, § 25.90), shall be maintained by the licensee for a minimum period of 12 months. The licensee shall make a record of each animal including the date it was received, the source and eventual disposition (Ill. Adm. Code tit. 8, § 25. The chart_apx 1 in Appendix 9 (Section 9.1) is based on the table (McKinney, 2008) in Appendix 9 (Section 9.2), and shows an example of a trend study of dogs at HSP which notes that the total intake of dogs and cats per year is increasing at HSP. Considering the main goals of a shelter association, reduce the numbers of animals euthanized and increase the numbers of adoptions, it is evident that there is a slightly increase of dog adoptions while the number euthanized remains stable.

2.3.Extern - Humane Society Program Description

One of my chief responsibilities as an extern was to act as the primary doctor of Humane Society animals. That included performing physical exams on all incoming animals, diagnosing, and recommending treatments for sick animals with the help of the Humane Society doctor that was daily chosen. Surgical (spay/neuter) experience is a priority besides being mandatory for an animal to be adopted. In addition, I was also invited to assist in any other surgical procedure of interest like soft tissue and orthopedic surgery.

Other responsibilities, besides shelter medicine, included: assessment of all hospitalized cases in order to relay current conditions to doctors at 8 a.m; assisting doctors seeing clients in order to enhance client communication; physical exams on all groom animals diagnosing, recommendations, and performing any required procedures/ tests; participation in all aspects of daily clinic procedures and prove competence in procedures such as blood draws, radiography, catheter placement, etc.

2.4.Extern Daily Routine

Every day plan is done the day before to manage time more efficiently, so I had more free time to do more spay/neuter surgeries in the actual day in the morning and to execute other extern's tasks in the afternoon. I checked for the next day in the file cabinet for P.E., vaccinations, suture removal, surgeries and treatments (including dewormings).

Every action performed is registered in an extern notebook as well as week plans, dosages, treatments and other notes.

2.5. Statistics

HSP records

According to HSP records, from March, 1 2009 till May, 1 2009 (2 months), some conclusions can be made.

From 89 total dogs that entered in ACC/HSP ~60% were successfully adopted, although ~7% died most of them during a parvovirus outbreak. It's interesting verifying that the most common ages of dogs relinquished are puppies less or equal 2 months and adult dogs between 1-3 years old. Probably the younger dogs are the result of unwanted litters or rescued from litters of roaming dogs and the age between 1-3 years old. Based on the study, examination of age at relinquishment and relinquishment category showed an increase in relinquishments for behavioral and mixed categories in dogs between 9 months and 6 years of age. The most frequent were also mixed breed dogs (lab mix and terrier mix) long aside with purebreds that represented ~30%, the most common Beagles (6), pure Labradors (5) and American Staffordshire Terrier (4) .

Due to time constraints cat's data was not analyzed.

Common Procedures done by the extern during externship

The most common procedure done by the HSP extern was physical examinations to all incoming animals as shown in Chart 3. Total incoming animals (cats and dogs) during the period mentioned was 175 (However the number of PE performed included, the re-evaluation of animals, during disease outbreaks. The number of checked and removed sutures is probably underestimated, considering that most of neutered animals, where checked during the next ten days after surgery. However, some animals were adopted few days after neuter surgeries.

Chart 3 corresponded table is on Appendix 9.

Fecal test procedures weren't taken into account, since all admitted animal had one was a standard protocol. Microchipping was done to every animal also, during neuter surgery. The ones I did correspond to the number of spays and neuters performed. If the animal was already neutered, received also a microchip (2 animals) but most neutered animals relinquished were already microchipped since these group were almost HSP returned animals.

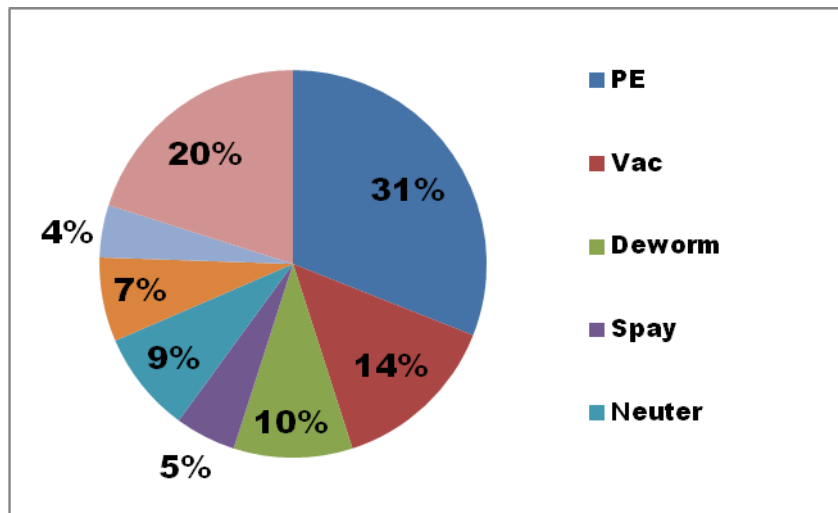


Chart 3 - The chart shows the percentage of common procedures to HSP animals during the externship. Data was from records from March 15, 2009 to May, 17 2009.

Cases assisted other animals (non-HSP): Table_apx 3 - Cases assisted (not edited)

Clinical Diseases at HSP are shown in Table_apx 4 - HSP clinical cases in Appendix 10.

3. Husbandry

The information provided in this section resulted from an interview with the kennel manager, Vicky Grandys, on May, 2010. The kennel manager created, verified the standard operation procedures and altered them if necessary.

3.1. Shelter building design and maintenance

HSP has a canine kennel (where is located a kitchen, laundry room and a room for storage) and a feline kennel. ACC like any regular clinic has five exam rooms for clients, a treatment area (Figure 12) where owner and shelter animals are treated and hospitalized, a surgery room with two surgery tables, an imagiology room, a training room, an office for logistics and a reception where is included the adoption center for feline.

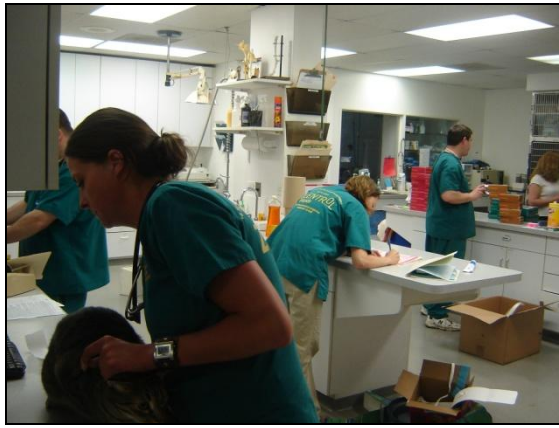


Figure 12 - Treatment room with ACC doctors.

The kennel design and construction was done by a specialized company, Mason® Company, on animal enclosures.

The canine kennel consists in four suites (A, B, C, and D), three wards, and an isolation ward for infectious diseases like canine parvovirus or canine distemper. Suites and wards have runs separated by doors, always closed. Two of the three wards were localized between the treatment area and the suites. Animals under treatment supervision were housed in the near wards, while third ward more distant the treatment area was reserved for quarantine animals and legally impounded animals. They stayed for a 7-10 day period before being released to HSP (C. McKinney, personal communication, April, 2009).

The isolation ward (Figure 13) consisted of 3 plastic cages, with all the treatment and sanitation materials inside so there's no mix with the other rooms but, on my point of view, it was too small for the number of animals normally involved in a disease outbreak.



Figure 13 - Isolation ward with one puppy suspect for parvovirus.

Suite C normally used for upper respiratory shelter dogs' isolation, considering this is the disease that is most prevalent in the shelter.

Suite D was for adoptable shelter dogs. Suite B is for boarding owner dogs. Suite A was left empty for kennel staff could use as a place to put shelter dogs when deep cleaning suite D (all-in/all-out housing) and normally used for new animal's transports so they don't mix with the adoptable animals or is left. In each dog suit there were double decker kennel and the upper floor was accessed by stairs was restricted to dogs less than 78 lbs (Figure 14).



Figure 14 – On the left image a Double-D Kennel System installed at HSP by the Mason Company. On the right, the computer sketch of the kennel. In each suite there was one Double-D System (from www.masonco.com).

Cages were good size and had approximately 6.5 foot at least height and are denominated indoor chain link lock runs for dogs these are manufactured with steel frames and chain link wire mesh fencing. are galvanized for maximum corrosion resistant integrity, although there was in some cages stairs sharp, rusted edges which are dangerous for animals and humans and could cause injury. Maybe the concern lies more in the fact that rust leads to pitting of the cage surface, which makes it hard to clean and disinfect appropriately. This leads to disease transmission despite efforts to sanitize (Spindle, 2010).

The dog exercise area was constructed with chain link also and it has a fence covered to avoid dogs from jumping and or escaping (Figure 15). The floor in the exercise was concrete, but indoor was cement covered with an epoxy surface to allow better sanitation. The concrete provides very unpleasant odors and becomes the perfect breeding ground for bacteria, mold and mildew which can greatly harm the dog's health. Walls were made of cinder blocks.



Figure 15 - Exercise areas outdoors for dogs.

Scientific data information is very sparse regarding the factors that impact disease levels and which type of conditions they apply. Some direct observations possibly conclude that the low ventilation factor on the upper decker worsen the animals URI disease and made treatment ineffective. The low ventilation caused a high percentage of humidity, a temperature elevated and also water accumulation on the bottom of the cages (UC Davis, 2007). Kennel staff used towels to reduce the humidity but I observed animals with their fur wet. Practical alternatives to this situation could be the use of fans on the upper floors or the installation of an air conditioning system but it is important to note that Humane Society of the United States (HSUS, n.d., ¶ 6), strongly discourages using triple-decker cages for any animal as well as double-decker cages and kennels for dogs and puppies considering it is difficult to clean and pose a danger to kennel staff when animals need to be placed or removed. It is acceptable double decker for cats if not positioned too high along the wall. There was no adoption center for dogs. They were moved by the volunteers from the healthy and adoptable dogs suite to the exam rooms where they were show the animal adoption applicant (see adoption process).

The kennel had double runs which were used more when there was an aggressive animal so cleaning was done in place as described in part I. However, it was used to place one more dog separated by the guillotine which increased the number of animals and movement of these to the exercise areas. Considering the theoretical information presented, shelter while trying to increased the number of adoptions, also increased the number of sick animals which decreased the first goal. This occurred because there was more contact and movement between potentially infected animals and susceptible animals.

The feline kennel is segregated from the canine kennel to minimize stress and noise. It is located in the upper floor of the building. When there was a feline disease outbreak, normally respiratory disease, a canine ward near the treatment area was used to isolate sick cats

which increased the level of stress but was easier for treatment procedures. This wouldn't be necessary considering that for upper respiratory disease in cats fomite transmission rests more on kennel staff cleaning procedures by assigning different caretakers for sick and health cats in the same room than airborne transmission (UC Davis Koret Shelter Medicine, 2007). The adoption center for felines had six steal cages with a transparent surface door (Plexiglass front ®). It doesn't compromising the air quality within the cages (UC Davis, 2007) and the public while waiting for a veterinary consult, could interact with the cats, play with them with the toys available, without poking them (Miller, 2004), This increased the chances for cat adoption.

3.2. Standard Operating Procedures and Sanitation

HSP had a daily routine cleaning/disinfecting procedure and deep cleaning was done through Monday to Sunday, ensuring that each suite, wards, exam rooms, treatment room, cat room and garbage, at least once in a week got deep cleaned, except suite C was deep cleaned twice, were scrubbed (floors, cages, doors, edges), cabinets wiped garbage's rinsed and so on. Kennel staff working shifts had to follow a procedures duty list for that day, to be done in numerical order and chart a sheet signing up for the procedure and their initials when done. The kennel manager verified everyday if all procedures were done correctly and reviewed if necessary. The procedures written in the duty list are as follows: the first procedure (1) is to feed animals, boarders, HSP animals and animals with special diets and while dogs eat the kennel staff checks the adoption center, clean obedience room, check outdoor perimeter for garbage/feces and check for any walk in baths/kennel grooms. After more or less one hour, kennel staff started to clean kennel in the numerical order (procedure n. 2). The first to get cleaned was suite C and the wards where normally sick animals were isolated and the next to be cleaned were suites A, B, D and isolation. According to Miller (2004), the flow traffic pattern should progress from the rooms with the healthiest and most disease susceptible animals (puppies and kittens) first to unadoptable and disease animals last, so suite C, wards and isolation should be the last. In the duty list there were important procedures like the suites drains to be cleaned also. The next following procedures: 3) disinfect water bowls and set to dry; 4) scoop out and hose runs; 5) rinse of pooper scoopers; 6) put away all equipment and supplies used; 7) clean any dirty, empty runs; 8) make sure all hoses are off; 9) clean groom room and walk any dogs; 10) take adoption cats to the feline kennel (last shift); 11) clean cat room; 12) take out the trash; others procedures not done in numerical order: clean and set up adoption center; make sure dumpster area, under the stairs drains are clean; check, clean, and organize bathrooms; check outdoor perimeter for garbage/feces; clean tub room and empty drain; put away donated

supplies/food if they came on during while on shift; empty garbages and put in new liners in the kitchen, kennel bathroom and adoption center. After the clinic was closed, there were other procedures for example other procedures were: clean all exams rooms; clean scales; vacuum and roll up rugs in the lobby; empty garbages and replace all bags; sweep lobby, treatment and surgery room (moving everything) and mop (using fresh/clean mop head); wipe counters in the surgery room; dump and rinse mop bucket and put mop head in washer; make sure all doors are locked and no animals outside (for example in the exercise area); rewater all areas (suites and wards in the same order mentioned earlier); turn off radios and lights. Extra attention to the dogs that went home the next day, so after clinic was closed, the kennel staff took the bath list and walked through the entire clinic writing down all of the dogs that were going home the next day and where they were located, this included boarders, animals in treatment rooms and HSP animals).

According to Miller (2004), some procedures needed to be review including the rags used for cleaning and mops used in the animal area, although at HSP the mops were washed every day.

For cleaning and disinfecting the kennel staff used bleach with laundry soap (Tide®), the latter according to kennel manager helps to clean the grease of the walls. QAD used only for treatment room because was expensive and Pine-sol® (detergent and disinfectant) is used for floors, but in my opinion had a scent too strong to be used in the kennel.

When a disease outbreak as URI occurred the cleaning was done by scrubbing the walls and floors and after spraying with bleach. This procedure according to UC Davis (2007) is correct for disinfecting URI contaminated areas, although the problem verified by me, was the drying afterwards that wasn't effective. The kennel staff used a squeegee but in the end the environment was always moisture. Poor drainage and/or poor ventilation may lead to environmental moisture, predisposing animals to disease (UC Davis, 2007, housing).

It was possible in HSP to implement an UC Davis (2007) recommended housing system: all in/all out. This was done when new arrivals of rescued dogs were admitted in the shelter, normally on weekends and the group only left the suite when the extern performed intake procedures examinations to all dogs. Only after, the suite was deep cleaned and dogs moved to adoption suite.

3.3.HSP nutritional challenge

HSP chose Purina® products, a commercial brand, to feed the animals. HSP received food donations but specified the preferred brand to their animals, in order to maintain their diet brand. Dogs are fed twice with dry food before going outside to the exercise area. Cats are

fed once in the morning and have free choice dry food offered, which agrees with Case & Fahey, Jr. (2004). Canned food was available and used mixed with dry when an animal was not eating properly. The typical type of food was for adult maintenance although other types, like for puppies and kittens was available. Other Purina® veterinary diets, if donated and available, were used to specific health conditions, for example, when dog or cat had diarrhea was used special diet EN, canned or dry. The dogs ate in disposable food card trays. The quantity of the food offered was pre-measured by a cup of the same size and not adapted to the animal weight, although when very active or mal-nourished, on their cage cards the staff wrote information to double the quantity of food offered. Dr. Miranda Spindle (Shelter Medicine Resident at UC Davis) suggests looking on the bag/can to find the recommended feeding amount and frequency for the typical foods and create a feeding chart for staff (5, 10, 25, 20lbs) and if animals are housed long-term it is useful to recheck their weight (Spindle, 2008).

3.4. Dog and Cat Care

All animals, cats and dogs at the time were admitted a neck band was placed. The neck band had the animal's name followed by an identification number, for example, HSP 1234, written with a permanent ink pen. Different color cards used to recognize animals more efficiently: red cards identify shelter animals (Figure 16); white cards identify boarding/hospitalized owner animals; orange cards identify aggressive animals.

HUMANE SOCIETY OF PLAINFIELD
ID# _____ NAME _____
ARRIVAL DATE _____ AGE _____
BREED _____ COLOR _____
SEX M F ADOPTION FEE _____
PROCEDURES TESTS VACCINES ALTERED
SPECIAL NEEDS _____

Figure 16 - Red card used as a shelter animal identification cage card.

Shelter animals also have additional cards that are used to identify treatments for a specific disease (green cards – disease name and done treatment date), surgeries (blue cards – date of sterilization surgery). These cards permit to inform the kennel staff how to proceed and take extra attention to their condition and also alert the HSP doctor/extern if any alteration is seen, for example, if the animal is not eating.

HSP dogs are always separated from other animals, like boarders, and they have their own cleaning and kennel supplies. Each HSP dog had his own cage (one dog per cage). When

dogs belonged to the same litter, family related or had a history of being together in the pound were they came from, only for their well being, exceptions were made and they (no more than 2 if adults) stayed together in the same cage. Dogs were walked twice a day and the cages cleaned twice a day. When they go to the exercise area, again, they are separated individually. They stay more or less fifteen minutes while the kennel staff cleans their cages. After they return, other dogs go outside and kennel staff cleans the next cages. In between, sometimes the feces from the first group were not removed or cleaned (Figure 17) properly and the second group could possibly become infected. This affirmation resulted from direct observations made by me while assisting the kennel staff daily activities; and dogs that were dewormed properly with negative fecal tests, few became symptomatic and/or with fecal tests positive for intestinal parasites, probably due to the contact of feces from another dogs in the exercise area.



Figure 17 – Presence of feces in the exercise area, before introducing the second group of dogs. A kennel staff member puts a new dog in the exercise area (left image) without removing the previous dog feces and the dog is in contact with them by smelling (right image).

All the information regarding treatments and special needs was written on the cage cards. Kennel staff had access to disposable gloves to protect themselves and avoid disease transmission between animals.

Cats were housed in the upper floor of the building, to minimize stress, on double-sided cages. Kennel staff cleaned their cages once a day and also it was provided an enrichment environment with toys, places to hide, elevating shelves and scratching posts.

Cats for adoption were moved from the holding areas to the adoption center in the reception area of ACC. Based on UC Davis (2007) information, it is counterproductive to their health because increased stress and increased the possibility of virus shedding between cats.

4. Disease management in H.S.P. shelter

4.1. Animal intakes and physical examinations

Animals were admitted in the shelter individually or could arrive in large groups, the latter occurred normally at weekends. They were placed in quarantine, normally after a complete PE unless they came on weekend days, and a PE examination was on hold. This procedure may jeopardize the health of other dogs and should be avoided according to Miller (2004). During the physical exams to all incoming animals, extern combined with the shelter doctor, verified the health history, performed all the necessary intake procedures, separating animals that need immediate medical attention and prescribed treatments.

The standard procedures on admission were:

- a complete thorough physical examination;
- fecal exam for parasites and preventative deworming;
- microchip, unless they haven't been neutered, otherwise they are microchipped during surgery;
- flea treatment;
- diagnostic test for heartworm and FeLV/FIV;
- vaccinations.

Each animal, dog or cat, had a folder with HSP name and number. The front page had different colors for dogs/cats and for females (pink)/ males (blue). In

4.2. Vaccination strategies

It is mandatory for every animal that arrives at HSP to have these following vaccines:

For canines: Rabies; Distemper/Parvo (6 way - DHLPPC): canine distemper, canine adenovirus type 1 and type 2, canine leptospirosis, canine parainfluenza, canine parvovirus, canine coronavirus; Upper respiratory vaccine – *Bordetella bronchiseptica* (BV). The recommended doses are: Distemper (6 way) – 6, 8, 10, 12, 16 weeks; Upper respiratory vaccine – 8, 10 weeks; Rabies – 16 weeks. For felines: Rabies, Distemper (4 way - DRCC): feline panleukopenia (feline distemper), feline viral rhinotracheitis, feline calicivirus, feline pneumotitis (*Chlamydia psittaci*). According to ACC (2008), rabies is endemic in the USA and many authorities recommend rabies vaccination for all cats, after more cats than dogs were reported to have rabies in 1981-1982.

Extra-vaccines that were not done in shelter animals are giardia and Lyme disease (for dogs) and feline leukemia.

I had instructions from most of the doctors to give vaccines in some different locations: bordatella vaccine (SC) and distemper (6 way) on the right front arm and rabies on the rear right leg. It is a way to know which vaccine caused a local reaction. Although giardia wasn't administered to shelter animals, was on left front arm and Lyme on left rear leg.

In cats veterinarians also give the rabies vaccine as distally as possible in the right hind leg, and leukemia vaccine in left hind; if a fibrosarcoma develops, there's better chance for a cure if the leg can be amputated (Thompson, 2010).

According to Dr. Kremer (2009), HSP animals should receive the following dosing protocol for vaccines:

- over one year old: 1 DHLPPC/DRCC and 1 canine BV
- 6 months to one year – 3 DHLPPC/DRCC and 2 canine BV
- 6 months and under – 5 DHLPPC/DRCC and 2 canine BV

BV was via intranasal unless the animal was aggressive. The vaccination protocol at HSP agrees with the AAHA canine vaccine guidelines and AAFP vaccine guidelines, although vaccines can help but are never a substitute for good overall animal husbandry

4.3. Diagnostic testing

All the animals had a fecal analysis to roundworms, hookworms, whipworms, tapeworms, coccidian and giardia as part of a basic anti-parasitic protocol.

Cats were tested to FeLV at the time of admission. A small amount of blood was drawn and sent to laboratory diagnosis. Litters at the HSP did a batch test. The advantages of a batch test could be financial but when there was a case of positive to a disease, the test needed to be repeated again but individually and isolation is necessary until the new results come out. Unlike FIV, testing for FeLV may be performed at any age. As mentioned, infection may take up to 1-3 months to develop, so results in young kittens are slightly less reliable. Samples should be tested individually; testing representatives from litters or pooling samples significantly decreases test accuracy FIV tests were performed to all cats over 6 months, because maternal antibodies interfere and interference has disappeared by 6 months (UC Davis, 2007).

Dogs that are older than 9 months – they do a blood test for HW. According to the American Heartworm Society, the earliest that heartworm antigen and microfilariae can be detected is about five and six months post-infection, respectively. Also antigenemia may be suppressed until about nine months post infection in heartworm positive dogs placed on macrocyclic lactone chemoprophylaxis. To determine when testing might become useful, a predetection period should be added to the approximate date on which infection may have been possible.

A reasonable interval is seven months. Thus, there is no need or justification for testing a dog for antigen or microfilariae prior to about seven months of age.

4.4. Selection of treatment protocols

The extern had to follow a list of pre-authorized treatment protocols defined by the HSP director. If an animal required treatment the extern was authorized the treatment following the protocol. Each protocol had a cost cap on what HSP would pay for a given case, so if the extern exceeded the cost cap, determined further treatment was necessary beyond the initial protocol or other non-approved medication must be used, the extern must have had a direct authorization from HSP director (Mrs. Meg Kremer) to proceed and should include noted authorization on the billing statement (Kremer, 2009). Any unauthorized treatments would not be paid by HSP.

When starting the animal on meds, the extern looked first for donated medications in the HSP bin and filled remainder needed from ACC stock, writing any ACC stock meds on the billing sheet. It was important two steps, the first for the veterinary technicians, the extern needed to chart the medications in treatment green sheets with the following information: name of the HSP animal and number, disease, and the medication, name, quantity (for example, number of pills in the envelope), dosage and duration of the treatment. Chart was placed in the treatment binder used by the veterinary technicians to be checked and when the treatment finishes the sheet goes to the shelter animal folder so when the extern sees it, knows that the treatment ended and the animal needs to be re-evaluated; the second step was for the kennel staff. The extern placed a green card "HSP Treatment" behind the regular cage card for disease name and duration of treatment. This was important to kennel staff moving the animals to a designated treatment area and monitor them and also protect themselves if was a zoonotic disease like dermatophytosis. Any alterations seen during treatment were communicated to the extern. Normally, all treatments are prepared and administered twice daily by veterinary technicians. When treatment is completed the chart was placed in animal's folder, marking off on the treatment sheet exam completed and date.

Respiratory disease

- **Canine Kennel cough**

The initial treatment consisted on:

- P/Z inj - penicillin and dexamethasone injection, once;
- cloramphenicol – 7 days, BID;
- cough tabs (for dry cough) – 3 to 5 days BID;

If URI/Kennel cough symptoms continue after 7 days of above treatment or worsen during that, after authorization, the standard protocol for further treatment was:

- cephalexin – 7 days, BID;
- amoxicillin – 7 days, BID;

In addition to protocol, dogs that had mild to severe dyspnea did also vaporizations twice daily to facilitate the elimination of mucous. Nebulizations with aerosol/non-absorbable antibiotics (e.g. gentamycin, polymyxin) might be beneficial according to HSP doctors.

When there was a resistance to treatment with amoxicillin, the HSP director, authorized the use of Clavamox® (amoxicillin and clavulanic acid).

- **Feline URI**

The initial treatment consisted on:

- P/Z inj – once.
- Amoxicillin – 7 days, BID (under 5lbs liquid and over 5lbs pill form)
- Viralys® (L-Lysine) 3-5 days

If URI symptoms continued after 7 days of above treatment or worsen during that, after authorization, the standard protocol for further treatment was:

- Clavamox® liquid – 7 days, BID

If dogs or cats had fever, it was authorized Ringer Lactate SQ fluids as an option.

Analyzing the protocol used at HSP and the literature, I found that instead of starting with chloramphenicol, because *Bordetella* and other secondary bacterial infections are the main agents responsible for kennel cough and also because *Bordetella* is susceptible to doxycycline, then if symptoms continued or got worse it was a possible sign of bacterial secondary infections and Clavamox® would be the second antibiotic chosen following doxycycline. Amoxicillin wasn't suggested in previous studies. And in cats, according to Ruch-Gallie, Veir, Spindel, & Lappin (2008) study of using amoxicillin for URI, ~50 percent of the cats had to switch to another antibiotic.

The P/Z isn't recommended by Dr. Miranda Spindle in the shelter environment - and not for URI or diarrhea cases. According to Dr. Miranda Spindle, in shelters, we are dealing with infectious issues. Targeting treatment more appropriately to either a probable cause, or running diagnostics would be a better approach.

One particular study in Humane Society of Indianapolis (Rees & Lubinski, 2008) asserts oral supplementation with L-lysine did not prevent upper respiratory infection in a shelter population cats highly susceptible to infection by feline herpesvirus by virtue of their stress

and close proximity with other cats. Animal shelters take several different approaches to prevent FHV-related upper respiratory infections (URIs), including empirically treating all cats with L-lysine, a supplement believed to prevent the replication of FHV and, therefore, manifestations of herpesvirus infections. In this study oral supplementation of L-lysine was tested as a means to prevent URIs. One hundred and forty-four cats were treated with L-lysine in a small amount of canned food once daily. A 'no treatment' group of 147 cats received no lysine during the course of the study. The development of conjunctivitis or URI was tracked between the two groups. In all measures, there was no effect between the two groups, suggesting that lysine was not able to prevent URI or conjunctivitis in our shelter situation. The study also suggests the infection control and control of fomite transmission are also key to keeping cats healthy in a group housing situation. The finding that lysine did not prevent URI in this animal shelter suggests that shelters, as HSP, may better use their resources by finding ways to decrease stress among their feline population, focusing on proper infection control measures, and limiting fomite transmission of disease.

Case study 1 – Kennel Cough outbreak in HSP



Figure 18 - Dog in isolation during kennel cough respiratory disease outbreak.

Handy issues like poor ventilation in the upper decker, lead to moisture and pooling of water on surfaces; the cleaning process The cleaning process itself may serve to spread, rather than prevent. Although I cannot prove scientifically, but considering for a general rule if “humans are comfortable, dogs and cats will be also” (Miller, 2004, p. 104), I can also assume that the disinfecting process used bleach or pine-sol in high concentrations, considering the excessive smell noticed during sanitizing operations. HSP used the right products for disinfectant but this should be applied via a sprayer or other application system rather than a mop and bucket used for floors which will quickly become contaminated. These factors could contribute to the high prevalence of kennel cough. For dogs, HSP used double

sided runs, but each side had a dog, unless it was very aggressive. Unfortunately, crowding in shelters is not uncommon, either due to insufficient facilities to provide even minimal care for the stray population, or (as is increasingly common) a well-intended attempt to decrease euthanasia by housing more animals. Tragically, such efforts may not only fail to improve the number of animals adopted, they may actually lead to increased disease and death. It is important to anticipate times of peak population of increased risk for respiratory disease outbreaks, and plan sufficient additional staff that husbandry is not compromised. For cleaning purposes the dogs needed to be moved, normally after eating, to the exercise area where they waited until the cage was cleaned and disinfected. The fact of moving and passing near other dogs can also be another factor for the kennel cough outbreak.

Besides animals were vaccinated for BV they contracted URI, considering previous studies the husbandry played a major role, because vaccines were given at the right time. Nevertheless is also important to note that BV it only protects against 2 of the possible 8 causes of kennel cough and the duration of immunity is 6 months (AAHA, 2006). The study concluded (Ellis et al., 2002) that injection followed by intra nasal booster demonstrated better protection, and this wasn't experimented at HSP.

Case study 2 - Respiratory Distemper versus Kennel Cough

Puppy with ~ 8 weeks old started with signs of kennel cough (sneezing coughing, green nasal and ocular discharge, show on Figure 19. After starting the protocol treatment, developed also high fever, severe anorexia, prostration and salivation and GI upset (vomit and diarrhea), 3 days after initial symptoms. A fecal test revealed positive for coccidia. Started also to show some behavior changes and weakness, for example, she tried to drink water from the bowl, putting her head inside but she couldn't even open her mouth. Few days later all the symptoms got worse, including bloody diarrhea. She was found dead on her cage, approximately 10 days after initial symptoms. No necropsy or tests were done to know the cause. Cage was disinfected with bleach and on quarantine for a few days. No other cases seen.

Medical treatment included antibiotics (amoxicillin-clavulanic acid (Clavamox®); metronidazole and sulfadimethoxine (Albon®)



Figure 19 - Female puppy dog HSP Judy died soon after the picture was taken suspect of respiratory distemper, on April, 2009.

Comment: This puppy was incompletely vaccinated so she was a high risk patient for canine distemper. Undoubtedly, distemper virus co-occurs with primary kennel cough pathogens and dramatically worsens the prognosis of infected dogs. According to Foley & Bannasch, (2004) at the most, testing for distemper and culture for *B. bronchiseptica* might be performed. It is important to note that kennel cough in shelter may be severe, and it is very difficult to distinguish between severe kennel cough and respiratory distemper.

5.4. Parasite treatment - deworming

Ectoparasites

For flea prevention was used Capstar® (nitenpyran). A tablet was given once when physical examination was performed when they arrived at the shelter. If needed was done once each month. It provided treatment on dogs, puppies, cats and kittens four weeks of age and older and two pounds of body weight or greater as well as for pregnant or nursing dogs and cats. Ticks prevention wasn't done as a regular procedure but only when there was evidence of ticks.

Endoparasites

Every dog and cat also gets a fecal test for parasites; a stool sample was collected at the admission exam by the extern or by the kennel staff afterwards. The results usually take one day so the correct anti-parasitic treatment can be prescribed, as it follows:

Treatment for parasites protocol was:

- giardia - 5 consecutive days of fenbendazole (Panacur®)
- whipworms – fenbendazole (Panacur®) for 3 days and repeat for 3 days in a month and again for 3 days in 4 months.

- coccidia – Albon (Sulfadimethoxine)- liquid suspension is used for cats and pills are used for bigger animals, double dose on day one and regular dose for 9 consecutive days.

According to Maddie's Program (2008), Albon® is not recommended for coccidian because its efficacy is poor, they recommend ponazuril (Marquis®)(extra-label for coccidian and very safe)

- hookworm - pyrantel pamoate (Strongid®), three times with two weeks apart or fenbendazole (Panacur®) for 3 days and repeat for 3 days in a month.

- roundworms – pyrantel pamoate (Strongid®). For puppies were done three times with two weeks apart.

- tapeworms – praziquantel (Droncit®) for the first day and repeat in one month.

A recheck fecal after completing the last dose of medication was done to insure proper elimination of the parasites.

According to Dr. Kremer (2009) the Strongid dose protocol when animals arrived at shelter was:

- over one year old: 3 deworming total with 2 weeks apart

- 6 months to one year – 3 deworming total with 2 weeks apart

- 6 months and under – 5 deworming at 4, 6, 8 and 10 weeks apart

Then after the fecal test results, the animals were dewormed according to the results.

5.5. Heartworm treatment

Dogs and cats, as for heartworm preventive was done once each month all year round starting at 8 weeks. For this is used normally donated medication. A heartworm prevention protocol treatment consisted on ivermectin (Ivomec 1% solution) and after a month the animal started with heartworm prevention with Revolution ®(selemectin)/ Heartguard® (ivermectine/pyrantel), once each month all year round .If positive, the animal is treated with an immiticide for two days, with 24 hours part. The risk of thromboembolic disease may be reduced if dogs are treated with a preventive product for 3 months prior to adulticidal therapy.

5.6. Skin diseases treatment

Skin scrapes were frequently done as diagnostic test for dermathopathy. However, even with negative results, prophylactic treatment was done.

- **Mange (Demodecosis) for dogs**

- Ivermectine (Ivomec® injection 1%), every 2 weeks, until skin clears, usually 2 or 3 injections

- Amitraz (Mitaban® Dip) for generalized demodicosis., applied either weekly or every two weeks
- **Ringworm (canine or feline)** – 1 case positive dog female puppy confirmed with Wood's lamp (Figure 20)
- Chlorhexidine scrub (before applying myosan cream) – diluted 1 part 9 parts of water.
- Griseofulvin – 425 mg/tablet compounding to 35 mg/kg bid
- Myosan cream® (cream for topic application in lesions)
- **Other dermatopathies - Skin/Ear infections**
- PCM solution (50% Animax® + 50% mineral oil + 3 cc 1% Ivermectin per 480 ml of mixture)
- Add-ons to PCM solution:
 - PCM + Baytril® 100 mg/ml to mixture – bacterial infections and could be applied in ears intact – 1cc/2 oz of PCM
 - PCM + myconazol 1% – for yeast *Malassezia infection* – 1/3 to 2/3 (Myconazol) of PCM volume



Figure 20 - HSP dog with a head and paws skin lesions caused by ringworm.

5.7. Gastro intestinal upset (diarrhea)

Treatment for an animal with a fecal test positive for parasites remained the same. If a dog has diarrhea and has a negative fecal test within the past 2 weeks or has tested positive for parasites, completed the treatment, but still has diarrhea, treatment is:

Dogs:

- **Diarrhea**

- P/Z/A (penicillin, dexamethasone, atropine) – inj.
- Brand diet (E/N) (continued for 3 days)

If a diarrhea persisted after one day, continued with brand diet and treat with:

- Panacur® – 5 days SID
- metranidazol – 5 days BID

If after above 5 day protocol a dog still had diarrhea or had not had a fecal test in the last 2 weeks, it is necessary authorization for further treatment. For infectious diarrhea suspects (example puppies with parvovirus) the protocol authorized was: animal 3 days in isolation with the following medical treatment:

- clindamycin
- ampicilin 15 mg/kg IV, TID
- famotidine: 0.5 mg/kg SID → metoclopramide 0.3 mg/kg IV TID
- sucralfate: ½ g mixed with water, PO, TID (donated)
- ketoprofen Inj
- fluids: Dextrose (Vit B) Inj
- metronidazol 15mg/ml, IV, BID (after authorization)

Cats

- **Diarrhea**

- Panacur – 5 days SID
- Metronidazol – 5 days BID
- Brand diet E/N – 3 days

5.8. Other Pre-authorized medications

- eye infections – triple antibiotic ointment (although tear drops would be more easy to apply).
- pain management:
 - Lidocaine SQ – (for spay/neuter) while under anesthesia. Gives 3-5 pain free at incision. Can be dribbled in by surgery technicians between skin and body wall.
 - Ketophen Inj – post-op if deemed necessary by a doctor on routine procedures
 - Morphine- only used major procedures, like orthopedics as deemed necessary by a doctor.

Comment: the protocol authorized needed to be reviewed for certain ailments as respiratory diseases but it is a good example correlating the cost-benefits of all the medications used in shelter animals.

5. HSP and Community Programs

These programs contributed to the health and welfare of animals. Most of all have been adjusted over time according to experience or based on actual studies. Volunteers and veterinarians were encouraged to participate in them.

The opportunity for the public to become involved in the life of the shelter and save life's by providing temporary alternative humane environments, not only housing but through contact, for marginal but adoptable animals should not be ignored (Miller & Zawistowski, 2004).

5.1. Microchipping

HSP microchips all animals dogs and cats prior to adoption.

According to the literature (Lord, Ingwersen, Gray, & Wintz, 2009), the high rate for return of microchipped dogs and cats to their owners supported microchipping as a valuable permanent pet identification modality, however, issues related to registration undermined its overall potential.

5.2. Spay and neuter policy and surgical techniques in the HSP

All animals available for adoption from HSP were spayed and neutered prior to becoming available for adoption. Kittens as young as 8 weeks old are spayed or neutered. According to HSP, the American Humane endorsed, in 1991, early spaying and neutering.

The American Veterinary Medical Association (AVMA) and the American Hospital Association believe the practice is safe and an effective tool to help end pet overpopulation. The policy of early spay/neuter is endorsed by American Humane Association, AVMA, Spay USA, American Animal Association, Winn Feline Foundation, Coalition for Animals (CFA) and other animals organizations.

The number of animals spayed and neuter performed by me were respectively 21 spays and 31 neuters, including 5 spay-neuter pediatric surgery to animals with 6 weeks of age, 2 spays to pregnant dogs and 1 dog spay in diestrus. During dogs spays, 3 had inguinal hernias which were resolved during surgery and one cat dehiss after being adopted.

The age to be spayed/neuter is for dogs, 3-4 months of age and for cats 4-6 months, although because of pressure for releasing animals to adoption, pediatric surgeries were done when animal was at least 8 weeks old or weighed equal or more than 2lbs. I personally experienced on 6 weeks old kittens (3 males and 2 females) where the HSP protocols followed were used and no surgery complications occurred.

The first neuter surgeries I assisted were done by the previous extern and the HSP doctors for the first month of my externship until I was able to do on my own. Different techniques were demonstrated and used by the externs. I describe the ones I was more comfortable with during the routine surgeries I performed.

Patients were selected the day before the day before from a list of animals available for neutering. A NPO (nothing per os) card for the spay/neuter surgery was placed in the cage, for the animal be fasten properly. Surgeries normally occurred in the morning and the kennel staff had to have that information, because the morning shift fed the animals early in morning. Some surgeries were postponed because of this or sometimes if it was an urgent surgery because the animal was going to be adopted, morphine was used to induce vomit.

A physical examination in the day of the surgery was done and the animals checked for risk diseases for neutering and if they were already altered. Sometimes, checking scars occurred after the anesthesia induction and not previous, as Appel & Hart (2004) recommend. The previous authors claims that on animals with URI, safely anesthesia and surgery can be performed but based on my own experience, exists a fine line to know if it is mild/severe URI considering there are no clear symptoms correlating with URI severity. I neutered animals with URI that had no complications and others that had low oxygen's levels during surgery and the URI became more severe, delaying the recovery. Although, if animal is going to be adopted, can be successfully treated individually.

Pre-medication was only used for dogs and consisted of atropine (1cc/20lbs, SQ) mixed with acepromazine (0.1cc/20lbs SQ), if less than eight years old because acepromazine lowers blood pressure.

Induction in dogs was done with a ketamine-xylazine mix (K/X) (1cc of xylazin in a bottle of ketamine), 1 cc/40lbs IV or 1cc/20lbs IM. In cats induction was made with ketamine-acepromazine mix (K/A) (1cc of acepromazine in a bottle of ketamine), 1 cc/20lbs IM, in a quick injection and the cat left in the cage. For older dogs and cats was used valium with ketamine ($\frac{1}{2}$ K with $\frac{1}{2}$ Valium), 1 cc/20lbs IV.

HSP pre-anesthetic drugs were administrated in a single injection that included anxiolytic, analgesic and anesthetic induction agents. Combining premedication's and anesthetic induction agents in a single injection is advised for spay-neuter programs, confirmed by ASV Task Force. The induction anesthetic protocol of K/X, according to message board opinions and ASV, is arrhythmogenic induces hypoxia and has no appreciable analgesia associated with it. HSP should use a more balanced protocol. ASV Task Force points out the routine use of anticholinergics such as atropine has decreased, owing to an improved understanding of the many adverse effects associated with their administration. Potential adverse effects include *ileus*, increased myocardial workload and oxygen consumption, hypertension,

increased tenacity of many body fluids (including urine and salivary, gastric, and pancreatic secretions), mydriasis and delirium and anxiety. Even in pediatric patients (between 6 and 16 weeks old) is not recommended because clinical studies and experience that supports its use are lacking.

After receiving the pre-medication, the animals waited in their cages and the table prepared with a endotracheal tube appropriate for the animal size, mineral oil for the eyes (HSP used protective eye lubricant to protect the cornea), a tie to hold the endotracheal tube, a syringe for the cuff and a pulse oximeter device; anesthetic machine is checked for the isoflurane level and corrected for the animal weight (kg); surgery kit correctly placed to be open.

The animal receives induction and after, dogs and cats are intubated and connected to a ventilator via endotracheal tube, except male cats that use a mask. If more than one surgery (two at the same time) externs could also use the other table were there's an anesthetic machine with a rebreathing circuit with a functional carbon dioxide absorbent. For a 20kg dog is used a 2 liter bag and for small dogs and cats a 500ml bag. The flow of O₂ is medium 20-40 ml/kg/min.

For cats, one drop of 2% lidocaine is placed on each arytenoid cartilage using a tuberculin syringe without a needle, before intubation. Once checking for leaks around the cuff, the adapter is connected to the anesthesia machine. The tube is tied in place using a plastic tie or one throw of square knot gauze around the tube. Now, the extern was ready to scrub, while the veterinary technician prepares the animal clipping hair and sterilizing the surgical area with chlorhexidine solution and alcohol, intermittently.

Maintenance anesthesia was with isoflurane inhalant.

There was equipment provided for visual and auditory monitorization, for example the pulse oximeter in one table or the ventilator in another gave information about patient status during anesthesia.

The extern wears a mask and surgical cap. For scrubbing is used beta iodine and chlorhexidine solution. Note that for shelter animals, surgical gown was not normally used so there was a minimum sterilization field, considering the time-cost benefits. Surgical gown are recommended when performing abdominal procedures. However their use is left to surgeon's discretion according to ASV Task Force.

The sutures preferred for shelter animals were chromic catgut for ligatures, abdominal wall and subcutaneous tissue and Braunamid® white for the skin. The use of chromic catgut for closing linea alba should be avoided considering that loses 33% of its strength in 7 days and 50% of its strength in 14 days, which is just not long enough for the linea, especially in an active patient (Wolfe, 2008, ¶ 1) and the fast degradation in presence of inflammation (Ragni

& Moore, 2010) increase the potential for dehiscence, although it is chosen for ligate ovarian/uterine pedicles for its granny and square knots (with 3 as the minimum number of throws) security (E & M, 1989), without breaking the suture.

Normally, intravenous fluid support wasn't necessary in the healthy young adult dog/cat.

Surgical packs, prepared by the veterinary technicians, had separate instruments for each patient, and for convenience divided for small and large spays and a neuter. They were sterilized by steam with a sterility indicator strip located outside the pack. This procedure is advised by ASV Task Force.

Spay/neuter surgery techniques described are based on my own personal experience and learned from the HSP doctors.

For spays the simplest technique performed was the two clamp technique. After rupturing the ovarian ligament, in each ovarian pedicle, two clamps are placed and then 2 square knots are done on the crushed site clamps. Knots are tied firmly. After sectioning the pedicle ovarian, a gaze is placed to check for hemorrhages. When ovarian pedicles were very engorged, short or with fat around them a Miller's Knot (Figure 21) was created by passing a length of suture material around a clamped pedicle twice to create two loops, with the second loop overlapping the first. It is very secure for pedicles and faster to execute.

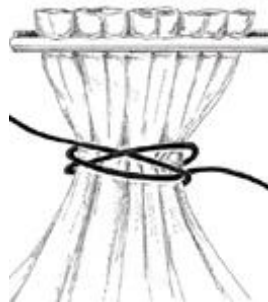


Figure 21 - Miller's Knot (from <http://veterinarynews.dvm360.com>)

The body of uterus was ligated with the two clamp technique also. The abdominal wall closed with simple interrupted pattern, subcutaneous tissues closed with simple continuous pattern and the skin closed with simple cruciate pattern, this last was used because facilitated the stitches removal. The authors (Appel & Hart, 2004) advise no skin sutures because suture removal may not be possible, but the skin sutures with a cruciate pattern were removed very easily (personal experience). Sometimes, skin adhesive (glue) could be used if necessary. The authors again recommend to use glue minimally and not be used along the entire length of the incision, to avoid getting excessive glue inside the incision as this can lead to granulomas and potentially draining tracts.

For castrations, close technique neuter was done on early age animals or small animals and the open technique done for large older animals.

After the surgery but before extubation, a microchip is inserted and other vaccines are also done, if necessary. A shot of ketoprofen (0.1cc/lbs) was administered as post medication for analgesia at extubation, and if there were donated oral ketoprofen or meloxicam were used for the next 3-5 days. On the incision, a bag of ice in a towel was placed to relief pain and edema for ~10 minutes. Then the animal returns to his cage and stays the night on observation in the treatment room. In the next day, is evaluated and if in normal conditions, returns to the kennel evaluated by the extern every other day, the following 10 days, till the suture is removed.

Sutures are check once every other day for possible infections, edema, pain, and so on.

All dogs and cats in the shelter receive the microchip when they are spayed or neutered. Shelter veterinarians are responsible for guarantee that dogs and cats are neutered prior to adoption. However, many animals have unknown health history records, and in many cases veterinarians have to look for scars and genitalia to be sure the animal hasn't already been neutered. In many cases, scars on females are extremely faint being only visible under a bright light on the table with alcohol rubbed onto the skin. When in doubt an exploratory laparotomy is done, and two were done during my externship. Considering practical reasons to save the grief to the animal, if females aren't being microchipped, veterinarians can use alternative, for example tattoos. It can be done safely quickly, and inexpensively. Other veterinarians choose to rub ink directly into the incision or put an X on the abdomen of cats using a scalpel blade followed by applying a drop of ink (Doll, 2005).

5.3. Behavior

This information is based on personal communications by trainer Maggie Vandermeer and I assisted a behavior evaluation example with a shelter dog.

One of the hardest things for staff, volunteers, and regular visitors to witness is the mental and emotional deterioration of animals housed at a facility for too long. This appears as depression, aggression, or other symptoms of mental stress (Guerrero, 2008).

Behavior assessment:

The evaluation was performed in a quiet indoor room. The sub-tests done by trainer Maggie to evaluate were for example:

- friendly approach by a stranger;

- basic obedience commands: “sit”, “down”, “stay”, and a “come”;
- removal of food bowl while the dog was eating;
- petting the animal and try to groom the animal;
- observed how the animal interacted with another dog.

The use of behavioral evaluations to classify a subset of shelter veterinarians as unadoptable is controversial issue. Life and death decisions are made on the output of instruments that may not be predictive of behaviors at other times or in other circumstances.

The criteria used are very subjective, for example in HSP’s case, and in the end we can only identify animals at extreme ends of the behavior: dogs highly sociable, confident and non-reactive are identified for adoption while those asocial, fearful and aggressive are identified for euthanasia.

Post-adoption behavior program

HSP adopted animals (less than 6 months) got a step by step, 3 week training, mandatory as pre-requisite for the animal to be adopted. This is important considering the behavioral reasons why pets are relinquished to shelters. It was a way to eliminate that risk factor and at the same time develop the human-animal bond.

Based on study (Duxbury, Jackson, Line, & Anderson, 2003) results suggested several practices that veterinarians may recommend to enhance the likelihood that puppies will remain in their first homes, such as enrolling 7 to 12 week old puppies in early learning and socialization classes. HSP offered Sit ‘N’ Stay Dog Training and Behavioral Counseling. A well trained dog is a product of a well trained and educated owner. Trainer Maggie VanderMeer has been training dogs and working with owners for 17 years. Her philosophy is to focus on clear communications and leadership while taking into account the diversity of each dog. The goal is to help dogs understand manners and behavior appropriate to our human world and teach families to communicate those skills clearly so their dogs understand what is expected of them.

Maggie’s approach emphasized the importance of leadership with lots of verbal and hands on praise with the goal of creating a positive bond with the dog by communicating effectively, teaching basic commands and good pack manners. Group classes are held in a private indoor area with no outside distractions.

Puppy I kindergarden for puppies 2 to 5 ½ months old was one hour class held for 3 consecutive weeks in the evening, emphasizes socialization, desensitizing and basic obedience. Cost was \$79 refundable deposit when 3 classes are completed or the \$79 can be applied toward the Puppy II class.

If the adoptive owners decided to proceed these classes were also offered:

Puppy II kindergarten for puppies that have completed Puppy I, emphasizes basic obedience, socialization and exercises designed to get and keep dogs attention and focus;

Basic beginners obedience for dogs 6 months and older; emphasizes leadership, basic obedience and exercises designed to get and keep dogs attention and focus;

Advanced basic obedience for dogs that have completed basic beginners obedience, emphasizes advanced obedience commands from a distance, over longer periods of time and learning more difficult commands.

5.4. Adoption

The animals were shown to potential adopters in the ACC exam rooms, with an HSP volunteer always present and on pre-scheduled days.

After someone chooses an animal to adopt, must fill an application indicating a specific animal the applicant intended to adopt. The applicant must be 21 years old or older and the application must be complete and questions answered satisfactorily. All questions were important; there were two that warrant further clarification. An application needed to indicate a specific animal the applicant intended to adopt.

If the adopter lived in an apartment or townhouse, HSP needed a copy of their lease agreement or association by laws stating they were allowed to had pets and whether there were restrictions on the size or number of pets. If the adopter had other cats or dogs present in their home, vaccinations and testes must be current, providing documents/receipts that specify cat or dog's immunizations/required tests were current. HSP could also call the veterinarian to get the information needed, if adopter didn't have the documents. The following vaccination or testing requirements must be met:

- all cats and dogs in the adopter's household must be spayed/neutered (mandatory for HSP and non-negotiable policy; experience had taught HSP that adopt into a home with an intach dog or cat can cause behavior problems that could escalate and could lead to one or more of the animals ending back to HSP or at another pound or shelter);

- dog's currently in the adopter's household must be on the following vaccinations/tests: RV; DHLPPC, BV, fecal test (in the last 6 months); heartworm test (in the last year). A heartworm test was required if adopting a dog but optional if adopting a cat.

- cats currently in the adopter's household must be current on the following vaccines: RV, DRCC, fecal test (in the last 6 months), FeLV/FIV test or vaccination (in the last year). The test was required of adopting a cat but optional for adopting a dog.

HSP offered 10% discount to a potential adopter for updating all the required tests at HSP's clinic. HSP was capable of a slight negotiation for vaccinations/tests requirements, with the

approval of the director in the instance of a hard to place animal. If the adopter had other pets in the household, HSP didn't required that the owner's brought them to meet an animal they wished to adopt however they were welcome and HSP encouraged them to do so if they were concerned to see how animals reacted to each other.

If an applicant informed HSP they did not want to complete the adoption by the end of two business days, the animal would be offered to the next applicant.

After application approval, the animal is ready to be adopted. The volunteer responsible for the adoption check out did the following procedures:

- checked if **adoption questionnaire** had all questions answered.
- verified **Pet Insurance** – copy of pet insurance if owners accepted (payment of 50\$ at time of adoption). New Pet Health Assurance shelter-related illness coverage is offered to help pay for medical expenses that may occur in the first 60 days (or maximum of 500\$ expenses). HSP could not offer any guarantee that the animal would get sick. However, the veterinarians help the adopter understand that had options to help minimize medical or financial issues that might arose even as soon as the first day the owner took the pet into his care. The list of diseases that may occur is: kennel cough/URI; ear and eye infection; mange/mite infection; parasitic and infectious diarrhea, parvovirus, gastritis. This coverage didn't include: vaccine boosters, genetic, hereditary or traumatic illness such as hip dysplasia, injury while playing and foreign body ingestion.
- stamped **adoption, opened new file** client and register all the new owner and animal information. It goes to a computer where reminders can be recorded like vaccinations to be done. Note: there wasn't a program to manage the medical records for the shelter animals, which could be easier not to forget procedures to be done at a correct time. It was the extern duty to check everyday what is needed.
- checked microchip
- **supplied heartguard/revolution**: cats and dogs heartworm prevention supllly was offered for one year;
- verified **HSP donation** – adoption fee were treated as donations and were required. Considering the cost to HSP of fully vetting a dog for adoption that is not spayed/neutered or on current vaccinations is over 300\$ and for a cat over 200\$, Charlie McKinney asserts (personal communication, 2009) that for an owner is less expensive this way then to pay for all medical expenses themselves when an animal is adopted from the pound. The adoption donation did not covered the cost of routine care (spay/neuter, vaccines, parasite tests, deworming, microchip, infectious disease testing, medical treatment and boarding), for example, when HSP recovered an animal from parvovirosis, the adoption fee in the end is only a small percentage of HSP's total costs with the animal; the adoption donation was used to help pay the increasing debt for care of many other needy animals.

Adoption donations for adult dogs ranged from \$59 to \$399 and puppies from \$159 to \$599. Adoption donations for adult cats range from \$29 to \$99 and kittens from \$59 to \$399; HSP asked more for puppies, kittens and purebred adults to help cover the expenses of the older mixed breed animals for which HSP received minimal donations and incurred significant debt. However, according to Charlie McKinney (personal communication, 2009) even at our highest prices, puppies and kittens are still half the price of pet store animals and our HSP's animals are already altered and up to date on vaccinations.

- **checked all vaccines** including rabies if they are done or need to be.
- Puppies under 6 months old are required to sign up for a **puppy obedience class**. (\$79 deposit required, refundable upon completion).

The process of adoption is finally completed after a first consultation with the future owners (mandatory by ll. law). The HSP doctor checks with them over the records and gives all the information about illnesses and treatments done to the animal as well as information about general diseases, like Hw and vaccines to be done. The doctor makes sure that all questions are answered and tries to do Pet Insurance. A P.E. is performed before relinquishing the animal to the owner (N. Sparks, personal communication, April, 2009).

According to Rebecca Hayes-Pearson, an HSP volunteer (personal communication, 2010), there is a program called SC4SC which stands for Senior Citizens for Senior Cats where old declawed cats and put them into senior homes instead of trying too hard to find them homes with regular adoptive families.

5.5.Surrendering an animal adopted from HSP

According HSP (2008), they are not obliged to take all surrendered, nor can they accept strays without prior approval of law enforcement/animal control responsible in the area where the animal is found.

HSP accepts animals that were adopted at HSP which owners can no longer keep or care for them and will take them back regardless of the amount of time the owners had the animal as long as they are not aggressive. This was noted on the adoption application the owners signed at the time of adoption; also when owners adopted they signed a statement that were going to keep he animal for the rest of his natural life and since HSP considers the owners have disregarded the oath, they will not be eligible to adopt from HSP again (HSP keeps also a records of owners not eligible). HSP also states they will not give refunds of adoption donations or reimburse medical expenses. At time of surrender, a donation to be used for the care of the animal once it is on possession of HSP is requested. The owners need to receive an authorization before they drop the animal off.

Not until recently, HSP doesn't accept surrendering animals not adopted at HSP.

5.6. Foster Care

HSP frequently needed people who can help over a week or two or just a weekend to help out in the following situations:

- Over Holiday periods when HSP needed to send the animals out to provide space for borders at the animal hospital;
- When puppies and kittens that were less than eight weeks old and/or under two pounds, not old enough for the HSP's adoption program with or without lactating mums; pregnant females went to foster also;
- Animals in need of special care due to illness.
- Animals that might have been abused or neglected could be rehabilitated through a foster family situation, were more likely to find good permanent homes.
- Some animals were overly stressed by the environment in the shelter and needed to have the type of attention that they only will get from a foster family, for example, anorexia or show stereotype behaviors like tail chasing or repeating jumping along the cage wall.

The foster program at HSP intended to provide a home and lots of interaction and attention, with the objective to improve the chances of being adopted. At the same time, there was socialization by providing situations where the animal was around other adults, children, noises and other pets. Monitorization by the foster for behavior and health helped to know the animal and after returning the animal to the shelter the foster family answered a questionnaire.

This program worked by identifying for foster care the animals with special needs. The first willing foster home would be give a time setup by the Foster Care Coordinator to come in and picked up the animals, all available information and supplies.

The animal stayed in the foster home until they are ready for adoption. Prior to the return date to shelter the animal is brought for a checkup or medical treatment as need prior to the HSP provides puppy pens, bedding, all medical care and food; advice on how to house, feed and manage the animals was available from experienced volunteers. A relief for weekends or vacations was available.

Foster families needed to apply and then were selected. families need to be weel informeed on what to expect on diseases and behavior of shelter medicines, in order to prevent disease transmitissin between litter and not to return the animal for behavior problems. Situations occurred when the animal started with evident signs of disease, prostrations and these were ignored because the caregivers weren't educated . Veterinarians can often be

very effective in helping foster caregivers being receptive to their needs and concerns to the health of their foster animals

5.7. Stray animals

The following information is based on HSP (2008) manuscripts.

HSP doesn't accept stray animals that have been found until certain legal requirements had been met. The requirements differed by village, township and county depending on who had jurisdiction over animal control in the area. If an animal was found, the police needed to speak with the individual finding the animal in order to determine the proper jurisdiction to impound the animal. In Plainfield, for instance, there were multiple jurisdictions based on township. The police may refer the individual to animal control or may pick up the animal themselves, depending on who was responsible in the individual's area. In some areas, the police might take a report only and gave further instructions on what to do to the animal. There was a 7 day holding period before the county could legally release the animal for placement, which gives the owners the opportunity to claim their animal. The agency which picked up and housed the animal during that period differs by area. After the 7 day requirement is met the County would issue a release to legally transfer the animal to HSP if it qualifies for placement. For the HSP to take in a stray that was not properly reported to the county or to offer the animal for adoption prior to receiving a release from the county would be a violation of the law.

In summary if a person finds a stray animal, it must be reported through local law enforcement/Animal Control jurisdictions. HSP could not accept a lost found animal from an individual; they must had a release from the county and during the holding period the animal belonged to the county although was housed in HSP. For that the county paid a small fee for each dog/cat.

5.8. Animal Abandonment

The following information is based on HSP (2008) manuscripts.

Individuals who wanted to dispose of animals at times used threats of abandonment and violence. These threats would be reported to the Humane Investigators of Will County. Leaving a pet at HSP facility or in the parking lot did constitute abandonment and HSP would prosecute. Releasing the animal to "run free", or dumping animals on the side of the road was also abandonment. In Illinois, pet owners, are responsible for humane care and treatment of their pets, providing food, water, shelter and veterinary care when needed to

prevent suffering. Failure to do so constitutes a Class B misdemeanor⁴. Animal abandonment constitutes a Class A misdemeanor. The maximum punishment for Class A misdemeanor is imprisonment for a term less than one year. A second or subsequent conviction is a Class 4 felony⁵; which is punishable by one to three years in the Illinois Department of Corrections. The Aggravated Cruelty statute prohibits a person from committing an act that causes a companion animal to suffer serious injury or death and constitutes a Class 4 felony. A second or subsequent violation is a Class 3 felony which constituted imprisonment between 2 and 5 years in State penitentiary.

5.9. Other shelter programs:

ACC offers continued education to their staff. There were also school visits made by the veterinarians' associates contributing for a better humane education to young children. The ACC donated their entryway to HSP to allow supporters an opportunity to honor or memorialize family members, friends and beloved pets. The Brick Walkway of Life will record lasting memories with paver bricks permanently engraved with the inscription of supporter's choice in block letters which will be legible from standing height.

HSP offered the community also a continued education with a myriad of information regarding how to adopt, how to introduce adopted cats to cats at home, dogs adoption to families with children and so on. There were HSP tours for schools to visit the kennel. I personally assist one for mentally challenged children.

All these programs and information contributed to the health and welfare of animals and help strengthen the human animal bond (Miller & Zawistowski, 2004, p. 315)

6. Euthanasia in HSP

Euthanasia drugs are kept in a securely locked cabinet because they are considered controlled substances. The shelter veterinarian performed euthanasia by injection of sodium pentobarbital intravenously.

The reasons for HSP euthanasia animals were behavioral, the animal was considered unadoptable for being aggressive and medical reasons in case of puppies with parvovirus when treatment failed. I didn't assist any euthanasia for other medical reasons, although one

⁴ **Misdemeanor** criminal charges are those that have a maximum sentence of 1 year in jail or less.

⁵ **Felony** charge carries a jail sentence of more than 1 year.

animal, a female cat, had also apparently mild respiratory disease and on necropsy performed after, the diagnosis was pneumonia.

7. Animal cruelty

The information on People and Animals in Community Together Humane Society [PACT], (2008) explains Humane Investigators in the state of Illinois must be approved by the Illinois Department of Agriculture and sponsored by a humane society or animal shelter. They may be volunteers or staff sponsoring organization- To become an Approved Humane Investigator it is necessary to obtain the sponsorship of a humane society or animal shelter prior to the exam on the Illinois Humane Care for Animals Act Study.

Citizens call the Illinois Department of Agriculture with complaints of suspected animal abuse and/or animal neglect by individuals (reports of abuse and/or neglect at pet stores, puppy mills, or other entities are investigated by the Illinois Department of Agriculture).

The Illinois Department of Agriculture searches their database for Approved Humane Investigators in that service area and routes the report of suspected cruelty/abuse to the sponsoring organization to dispatch an Approved Humane Investigator for follow-up.

The Approved Humane Investigator works within the guidelines established by the Illinois Department of Agriculture in resolving the complaint.

HSP sponsors a Humane Investigator, Cindy Williams for all of her time, effort and care in rescuing needy animals from bad situations. During my externship there was a case of kittens found in the trash.

I wasn't able to contact Cindy Williams during the writing of this dissertation to demonstrate a recent case involved with HSP. Instead, the following case is a transcript of ASPCA case on (Reisman, 2004): *"In a recent case at ASPCA, a woman with a young child presented with a Cocker Spaniel that was a victim of neglect. The animal had a terribly objectionable odor that could be smelled in the hospital the next day. The haircoat was severely matted, especially around the ears. The ear mats were soiled with blood and feces. Sarcophagid fly larvae were feeding on ulcerated and necrotic tissue at the base of the right ear. The woman's story at presentation is that she had left the animal with someone for a period of months and had returned to find the animal in severe state of neglect. She expressed the outrage at the animal's condition. In addition to the hair and skin problems, the dog had an oral tumor, severe dental disease, and a chronic cystitis. Our human law enforcement department was notified of the case. After an investigation into the whereabouts of another individual proved fruitless, the woman was re-interviewed and this time confessed that she had been solely responsible for the dog's welfare. The dog was legally seized, a criminal summons was served and child welfare was notified of the case"*.

CONCLUSION

Shelter medicine has become the search for innumerable questions that need to be answered, for effective disease management strategies, to use while the animal shelter is housed in the shelter and what to do in terms of community, for example, decreasing the number of hoarding animals and increases the number of adoptions. Disease management is not only based on prophylactic and treatment protocols (medical procedures). As described, it involves several other factors found in the animal surrounding environment: husbandry factors that include the building where the animal is housed, sanitation to prevent disease transmission, a good nutrition that affects directly the ability of the animal to resist disease. Shelter medicine has also a duty towards the community while looking after the animals relinquished. Reducing the number of animals involves efficient and low-cost spay/neuter surgery techniques, humane education, and so on. Because there have been few precious clinical studies or scientific research and the ones regarding particular aspects are very sparse, veterinarians are forced to rely heavily on instinct, clinical impressions resulting from direct observations, networking and extrapolation from other data. This thesis had also the purpose to demonstrate the theoretical implications of the few data available and practical applications of shelter medicine in a private rescue shelter, Humane Society of Plainfield, Illinois, USA. In the end is evident, the urge to seek out and consult other experts in their respective fields for help to meet the needs of both animals and society and adjust to different communities shelters. There are variances within and between shelters and shelter organizations, in budget, mission circumstances, different environmental shelter settings that together predispose animals to different diseases and care demands. A veterinary is faced with a lot of questions that need to be answered and I'm confident that the evolution of shelter medicine has just begun and new specialties inside shelter medicine will also evolve.

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Appendix 1

Statistics data about USA animal shelters, pet ownership and overpopulation facts

Facts about USA animal shelters:

- Estimated number of animal shelters in the United States: 3,500 (HSUS); 5000 (ASPCA)
- Approximately 5 million to 7 million companion animals enter animal shelters nationwide every year, and approximately 3 million to 4 million are euthanized (60 percent of dogs and 70 percent of cats). The percentage of euthanasia may vary from state to state (ASPCA and HSUS).
- The estimated number of cats and dogs adopted from shelters each year: 3-4 million (HSUS)
- Less than 2 percent of cats and only 15 to 20 percent of dogs are returned to their owners. Most of these were identified with tags, tattoos or microchips (Source: NCPPSP); 30 percent of dogs returned according to HSUS.
- Twenty-five percent of dogs who enter local shelters are purebred (ASPCA);
- Only 10 percent of the animals received by shelters have been spayed or neutered. About 75 percent of owned pets are neutered. (Source: ASPCA)
- The majority of pets are obtained from acquaintances and family members. About 15 to 20 percent of dogs are purchased from breeders, and 10 to 20 percent of cats and dogs are adopted from shelters and rescues. (Source: Ralston Purina and NCPPSP)
- More than 20 percent of people who leave dogs in shelters adopted them from a shelter. (Source: NCPPSP)
- Five out of ten dogs in shelters and seven out of ten cats in shelters are destroyed simply because there is no one to adopt them (ASPCA).

Facts about pet ownership in the USA:

- According to the National Council on Pet Population Study and Policy (NCPPSP), about 65 percent of pet owners acquire their pets free or at low cost.
- The majority of pets are obtained from acquaintances and family members. About 15 to 20 percent of dogs are purchased from breeders, 10 to 20 percent of cats and dogs are adopted from shelters and rescues, and 2 to 10 percent are purchased from pet shops. (Source: Ralston Purina and NCPPSP)

- At least 20 percent of cats are acquired as strays. (Source: NCPPSP) Many strays are lost pets who were not kept properly indoors or provided with identification (ASPCA).
- More than 20 percent of people who leave dogs in shelters adopted them from a shelter. (Source: NCPPSP)
- The cost of spaying and neutering a pet is less than the cost of raising puppies or kittens for one year (ASPCA).
- The average cost of basic food, supplies, medical care and training for a dog or cat is \$700 to \$875 annually (ASPCA).
- About 75 percent of owned pets are neutered (ASPCA).

Facts about Pet Overpopulation:

- It is impossible to determine how many stray dogs and cats live in the United States; estimates for cats alone range up to 70 million (ASPCA).
- The average number of litters a fertile cat produces is one to two a year; average number of kittens is 4-6 per litter (ASPCA).
- The average number of litters a fertile dog produces is one a year; average number of puppies is 4-6 (ASPCA).
- Owned cats and dogs generally live longer, healthier lives than strays (ASPCA).
- Most strays are lost pets who were not kept properly indoors or provided with identification (ASPCA).
- Only ten percent of the animals received by shelters have been spayed or neutered. About 75 percent of owned pets are neutered (ASPCA).
- Five out of ten dogs in shelters and seven out of ten cats in shelters are destroyed simply because there is no one to adopt them (ASPCA).

Appendix 2

Asilomar Accords (2004) list of categorizations/definitions

Healthy: the term "healthy" means and includes all dogs and cats eight weeks of age or older that, at or subsequent to the time the animal is taken into possession, have manifested no sign of a behavioral or temperamental characteristic that could pose a health or safety risk or otherwise make the animal unsuitable for placement as a pet, and have manifested no sign of disease, injury, or congenital or hereditary condition that adversely affects the health of the animal or that is likely to adversely affect the animal's health in the future.

Treatable: the term "treatable" means and includes all dogs and cats who are "rehabilitatable" and all dogs and cats who are "manageable."

Rehabilitatable: the term "rehabilitatable" means and includes all dogs and cats who are not "healthy," but who are likely to become "healthy," if given medical, foster, behavioral, or other care equivalent to the care typically provided to pets by reasonable and caring pet owners/guardians in the community.

Manageable: the term "manageable" means and includes all dogs and cats who are not "healthy" and who are not likely to become "healthy," regardless of the care provided; but who would likely maintain a satisfactory quality of life, if given medical, foster, behavioral, or other care, including long-term care, equivalent to the care typically provided to pets by reasonable and caring pet owners/guardians in the community; provided, however, that the term "manageable" does not include any dog or cat who is determined to pose a significant risk to human health or safety or to the health or safety of other animals.

Unhealthy & untreatable: the term "unhealthy and untreatable" means and includes dogs and cats who, at or subsequent to the time they are taken into possession, have a behavioral or temperamental characteristic that poses a health or safety risk or otherwise makes the animal unsuitable for placement as a pet, and are not likely to become "healthy" or "treatable" even if provided the care typically provided to pets by reasonable and caring pet owners/guardians in the community; or are suffering from a disease, injury, or congenital or hereditary condition that adversely affects the animal's health or is likely to adversely affect the animal's health in the future, and are not likely to become "healthy" or "treatable" even if provided the care typically provided to pets by reasonable and caring pet owners/guardians in the community; or are under the age of eight weeks and are not likely to become "healthy" or "treatable," even if provided the care typically provided to pets by reasonable and caring pet owners/guardians in the community.

Appendix 3

Other considerations when designing a shelter building

Heating ventilation and air conditioning systems (HVAC): air change rates requirement to prevent disease spread are frequently cited. Examples include 6-20 air changes per hour,¹ and 100% fresh air exchanges every 6-10 minutes (Johnson, 2004, p. 60). Strict requirements for a may not be critical for shelter animal health but the bottom line requirement, especially for cats, is good air quality within animal housing units. Lower population density helps maintain air quality, and fresh air or outdoor access for both dogs and cats may lessen respiratory disease. Maintaining a lower population density and providing access to fresh or outdoor access for both dogs and cats, may lessen respiratory disease.

Plumbing systems: Each and every animal housing area (including public areas) should have at least one sink with a paper towel dispenser and hand sanitizer dispenser. Each housing area should also have at least one drain. Strong recommendations for either individual drains or trench drains are made on Antoniadou (2004), they should be well designed, appropriately placed (Figure_Apx 1), adequately cleaned, and functioning because drains difficult to clean or that are accessible by various animals can transmit disease. Drains absolutely should not be placed in walkway areas.



Figure_Apx 1 - Inappropriate drain placement (from Jones, 2007).

Barking noise: Decrease barking noise within dog housing areas. Barking noise in shelters is often unacceptably high, regularly exceeding the measuring capacity of the dosimeter, which was 118.9 decibels, according to Coppola, Enns, & Grandin (2006) and causes

physical and psychological stress in dogs. The authors assert that shelter design often fails to address noise abatement. Creating multiple smaller dog housing areas rather than fewer larger housing areas is probably the most effective way of minimizing barking noise. Proper material selection also reduce the din of barking (HSUS, 2010).

Automatic Feeders and Waterers: are difficult to clean and disinfect, reduces the opportunities for interaction and socialization between the animals and their caretakers. In addition, food and water intake should be monitored (HSUS).

Electrical Sockets: should be positioned on the wall at least three feet above the floor to avoid “splash-ups” of water and cleaning solutions used when hosing (HSUS).

Flooring: Appropriate flooring materials are vital for good cleaning in which microorganisms and odors are minimized, for example, poured floors with a minimum of seams are best. Ceramic tile is not a recommended for kennel or housing areas because grout is permeable and therefore impossible to clean adequately (HSUS).

Height of Solid Dividers between Kennels: For kennels made of chain-link fencing (Figure 3.1-4), a solid divider must be installed to avoid nose-to-nose contact among dogs. For large dogs it is five feet or higher. For small-to-medium dogs, four-foot-high dividing walls are generally acceptable (HSUS).

Lighting: Lighting fixtures in kennels should be placed over dog runs rather than down the middle of the aisle separating facing runs. This makes it easier for visitors and staff to view the animals and safety hazard is created for the public or staff (HSUS).

Security Any animal shelter should be concerned with security measures like fencing, security cameras, and limited access to entrances around the building, proper lighting, locks on animal housing areas, and any locations where drugs or money is stored. It is imperative for every shelter to install a fire-alarm system and institute an emergency evacuation/disaster plan (HSUS).

Wall/Floor Joints Any wall/floor joints should be covered because are impossible to clean properly (HSUS).

Appendix 4

Overview of zoonotic diseases common in shelters.

Zoonotic diseases found in the gastrointestinal tract of animals

- Campylobacteriosis; Dogs, cats, many other mammalian and avian species.
- Echinococcosis- Hydatid disease; Dogs
- Giardiasis; Dogs (reported prevalence up to 25-36% in dogs with diarrhea), cats.
- Hookworm (Ancylostomiasis); Dogs, cats
- Roundworm (Toxocariasis); Dogs, cats, raccoons.
- Salmonellosis; Reptiles, many other species, including dogs, cats, birds and livestock.
- Toxoplasmosis; Cats.

Zoonotic skin diseases

- Cheyletiellosis; Cats, rabbits, dogs.
- Ringworm (Dermatophytosis); Dogs (young animals, Persian cats and Yorkshire terriers at greater risk).
- Scabies (Sarcoptic mange); Dogs, cats

Zoonotic diseases spread by bites and scratches

- Bartonellosis (Cat Scratch Fever); Cats, Kittens.
- Dog and Cat Bites (Pasteurella and Capnoytophagia infection); Dogs, and Cats.
- Rabies Most warm blooded animals can be infected.

Miscellaneous zoonotic diseases

- Kennel Cough (Bordetellosis); Dogs, cats
- Leptospirosis; Dogs (cats uncommonly affected).

Appendix 5

PetPoint statistics about common diseases in shelter

"Urinary Tract Infections" category:- Cystitis; Feline Lower Urinary Tract Disease, Urolithiasis

- The percentage of dogs and cats that entered animal welfare organizations and were subsequently diagnosed with Urinary Tract infections was 0.25%. Of these infected intakes 61% were cats;

"Mange and Mite Infections" category - Sarcoptic mange; Otodectes cynotis infection; Notoedric mange; Cheyletiellosis; Demodectic Mange in Animal Less Than 5 Years Old;; Cheyletiella; Ear Mites; Mange; Mites

- The percentage of dogs and cats that entered animal welfare organizations and were subsequently diagnosed with mange and mite infections was 1.64%. Of these infected intakes 83% were cats.

Canine Parvovirus and Feline Panleukopenia

- Canine Parvovirus and Feline Panleukopenia affect less than 1% of all animal intakes.

Kennel Cough

- The problem of Kennel Cough affecting animals within the care of the animal welfare community is primarily a canine problem, affecting 1.5% of all dogs taken into the animal welfare community through PetPoint

URI in cats

- URI affected 3.35% of all cat intakes into organizations running PetPoint

Appendix 6

Basic physical exam for shelter animals

Goals:

- To identify and isolate animals with infectious disease as soon as possible
- To evaluate health and behavioral status for determination of adoptability
- To provide the lost and found department with accurate physical descriptions of animals
- In the shelter, a primary diagnosis is not always the ultimate goal
 - Many shelters do not treat specific medical conditions, but offer symptomatic and palliative care based on symptoms alone.

Equipment:

- Quiet, well-lit examination area; Non porous examination table; Hair clippers; Stethoscope; Thermometer; Otoscope, ophthalmoscope; Muzzle (or gauze rolls); Penlight; Wood's light; Disposable exam gloves; Appropriate restraint and safety equipment; Separate scale for cats and dogs; Flea comb; Cotton tipped swabs; Nail clippers; Suture scissors; Intake supplies.
- Tranquilizers; Disinfectants; Alcohol;
- Tests for: parvovirus, FeLV, FIV; Heartworm
- Microscope: Stain, slides, scalpel blade
- Sample collection
- Fecal float

Procedures:

1. A complete description of the animal (species, breed, color, age, including distinguishing characteristics; check for microchip, tattoo, or other identification that may reunite a lost pet with his owner);
2. Determination the sex of the animal and verification if the animal has already been neutered;
3. Evaluation of behavior
4. Complete thorough physical exam checking:
 - a) Overall appearance and attitude
 - b) Determination of temperature, pulse and respiratory rates
 - c) Hydration status
 - d) Weight

- e) eyes (including evaluation of the third eyelid)
- f) evaluation of the head and mouth
- g) nose
- h) examination the mucus membranes
- i) examination oral cavity (teeth)
- j) check trachea
- l) check body score
- m) examination of the body (lymph nodes, body in general, abdomen, feet and extremities, external genitalia; anus and tail area)
- n) examine skin and hair coat

5. Segregation of animals suspect of infectious diseases by identification of these signs:

- Signs of URI: ocular and/or nasal discharge; conjunctivitis; sneezing.
- Oral ulcers with fever or sweeling
- Circular patches of hair loss
- Dead in cage
- Signs of GI upset : bloody or severe diarrhea; vomit or diarrhea with other signs of disease;
- Neurologic signs (including eyes)

6. Segregation of animals for emergency treatment

- Fever > 106.5 Fahrenheit
- Trouble breathing
- Seizures
- Cyanotic gums
- History of recent "hit-by-car"
- Bleeding or extensive easy bruising
- Swollen abdomen
- Blocked cat
- Pregnant in distress
- Acute severe lameness or bone exposed
- Major wounds or any wounds requiring sutures

Examination tips:

- examine the animal from a distance as well as from close up;
- wash hands between animals and disinfect the exam table and equipment;
- use an identification form that allows to check off items;
- establish a systematic approach.

Appendix 7

Decision tree for URI treatment in cats

Category 1 - Signs are limited to one or more of the following: Clear (not yellow, green or bloody) discharge from the nose or eye, sneezing, oral ulcerations.

Assessment: Most likely mild viral infection or vaccine reaction or without significant bacterial component.

Treatment: Isolate; Offer wet cat food BID; Assess daily for appetite, fecal quality, hydration, progression of signs.

Category 2 - Signs: Signs as in category one accompanied by more severe systemic signs such as fever, inappetance, dehydration, lethargy.

Assessment: Most likely more severe primary viral infection.

Treatment: Same as for category one and check hydration AND body temperature BID; SQ fluids as needed to maintain hydration; Antipyretic if fever >106o Fahrenheit; Nutritional support if not eating > 48 hours: heat food, offer variety of food, force feed/tube feeding if needed. All severely depressed/dehydrated cats in shelters should be assessed for possible panleukopenia

Category 3 A (respiratory) - Signs: Green/colored nasal discharge (may be accompanied by other signs as in category two).

Assessment: Most likely viral infection with non-specific secondary bacterial infection.

Treatment: Same as for category one/two (depending on severity) and oral antibiotics that provide reasonable gram positive coverage with a dosing frequency that shelter staff is able to maintain (often limited to SID or BID treatment) Reasonable choices include: first generation cephalosporins, amoxicillin, clavamox, clindamycin, doxycycline (basic antibiotic choice – Doxycycline, 10 mg/kg SID q 7-10 days (Spindle & Makolinski, 2008)). First choice may need to be changed periodically as drugs may lose efficacy over time in a population. Broader spectrum and more expensive drugs can be reserved for cases that fail to respond to the above antibiotics i.e. fluoroquinolones, trimethoprim sulfa.

Category 3 B (Ocular) - Signs: Marked eye signs along with URI: clear or colored ocular discharge and/or moderate to severe conjunctivitis along with other signs of URI as described above. May be combined with category 3A.

Assessment: Most likely primary viral URI with secondary non-specific bacterial infection of the eyes.

Treatment: Same as for category one/two (depending on severity) AND broad spectrum topical eye ointment⁶ such as neomycin-polymixin-bacitracin. Other acceptable choices include Terramycin or Chloramphenicol ointment, but these may be more costly.. If ocular inflammation worsens after administration of topical therapy, treatment should be discontinued or a different treatment tried at the discretion of the veterinarian. (Eye ointments can actually worsen irritation in some cats.)

Category 4 - Signs: Eye signs only: clear or colored ocular discharge/conjunctivitis with no other signs of URI.

Assessment: Most like primary bacterial eye infection by *Chlamydomphila* or *Mycoplasma*, or chronic feline herpes viral infection. Marked swelling of the conjunctival tissues is more likely to be caused by a bacterial infection, while corneal ulceration suggests feline herpes infection. If condition worsens with treatment or persists for more than two weeks, medications should be discontinued and definitive diagnostics should be performed.

Treatment of suspected primary bacterial infection: as for category one/two (depending on severity) and topical eye ointment with good intracellular penetration (terramycin or chloramphenicol). In severe or persistent cases, oral antibiotics effective against intracellular organisms should be used. Doxycycline is the most reliable choice for treatment of *Chlamydomphila*. Doxycycline is preferred over tetracycline in kittens because it is less likely to cause tooth staining. If response to treatment is observed in first 7 days, continue treatment for a minimum of 3 weeks.

Treatment of suspected chronic ocular herpes infection: As for category one/two (depending on severity) AND Topical antiviral ocular eye ointment or drops. Removal from shelter environment; signs may resolve with decrease in stress.

Category 5 - Signs: Additional signs not consistent with typical URI, such as severe diarrhea or vomiting, coughing, or URI that does not respond to treatment as expected.

Assessment: These cases should be worked up individually by a veterinarian. Cases of URI that have not improved significantly after two weeks of appropriate treatment should receive a further work-up, including testing for FeLV/FIV if not already performed.

⁶ Ointments containing steroids should be avoided unless a veterinarian has specifically determined there is no corneal ulceration present and steroids are indicated

Appendix 8

Anesthetic protocols for routine spay-neuter surgeries

The Appel & Hart (2004) use the following anesthetic protocol for young adult dogs and cats, listed in :

- Premedication: 0.02 mg/kg SQ or 0.01 mg/kg glycopyrrolate SQ with 0.2 mg/kg butorphanol,
- Induction: 1 ml/10 kg ketamine:valium IV (in a 1:1 ratio); if this combination is not available thiopental (12mg/kg IV) can also be used as induction agent; a low dose of acepromazine is usually effective to sedate excited patients (dose range 0.02-0.04 mg/kg, not to exceed the maximum of 3 mg/kg). Acepromazine should be avoided in patients with liver, heart disease, geriatric and pediatric patients, dehydrated animal and Boxers. Is not usually known for shelter animals, acepromazine should generally be used only when needed in the nontractable patient.
- Maintenance: isoflurane inhalant anesthesia in 100% percent oxygen. ASV Task Force recommends oxygen supplementation by mask 2 to 5L/min.
- Postoperative: 0.2 mg/kg butorphanol SQ
- Analgesia (to be given at time of extubation, directly after the endotracheal tube is removed)

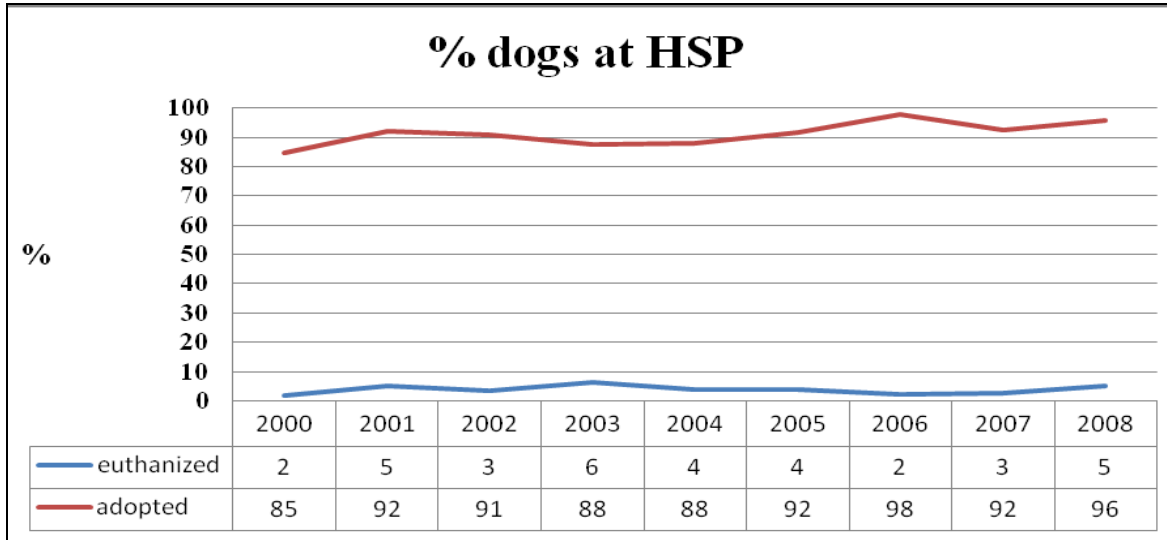
Appel & Hart (2004, table 22.3, table 22.4) uses the anesthetic protocol for pediatric canine and feline ovariohysterectomy and castration, described:

- premedication: 0.02 mg/kg atropine SQ and 0.20 mg/kg butorphanol SQ
- induction: ketamine/valium 1.0 ml/10 kg IV (1:1 ratio)
- maintenance: isoflurane (mask with isoflurane if necessary for castrations)

Appendix 9

Section 9.1. Charts

Chart_apx 1 Percentage of dogs adopted and euthanized, at HSP, between years 2000-2008



Section 9.2 Humane Society of Plainfield Scorecard

Appendix 10

Tables

Table_apx 1 of procedures done to HSP animals from March 15, 2009 to May 17, 2009.

Procedures	Count
PE	128
Vac	58
Deworm	41
Spay	21
Neuter	35
Check sutures	29
Remove sutures	18
Treatment prescribed	83

Table_apx 2. Total of animals recorded by the extern from March 15, 2009 to May 17, 2009.

total animals	Animals Id.	M	F	N id	Total animals
dogs	106	51	55	19	125
cats	33	15	18	17	50

Table_apx 3 - Cases assisted (not edited)

exotic	dog	cat	area	Diagnostic	disease	notes
	1		internal medicine	Septicemia		
	1		oncology	cartilage tumor		
	1		endocrinology	simetrical alopecia and gain weight		
		1	surgery	facial laceration		
rabbit			surgery	Spay		
	1		surgery	TPLO		
	1		surgery	TPLO		cocker spaniel left leg; 7 years
	1		internal medicine			sharpei fever
	1		surgey	cranial cruciate ligament rupture		
rabbit			surgery	Spay		
rabbit			surgery	Neuter		
	1		endocrinology	Hypothyroidism		facial paralysis in sheperd dog
	1		Gastroenterology	megaesophagus generalized		german sheperd dog; 4 years
	1		surgery	Orthopaedics		radio ulna comminutive fracture
	1		surgery	Spay		fatty and hard
	1		surgery	cranial cruciate ligament rupture		labrador retriever; name: Lucy
	1		necropsy	Deceased		found in her cage
		1	surgery	Deiescence		under 6 months
			surgery	paw laceration		labrador

			surgery	Lombectomy		anterior lombectomy, right elbow ; mast cell tumor
			surgery	stomach decompression		female labrador senior ; stomach decompression – ate a ginger bread house
		1	respiratory	feline asma		
		1	gastroenterology	regurgitation cat		
	1		necropsy	puppy died of parasites infestation		
	1		imaging	pen hip examination		
	1		surgery	Entropion		
	1		surgery	Orthopaedics		cruciate
	3		surgery	Dentals		
	1		surgery	Spay		
	1		surgery	Lombectomy		
		1	surgery	Declaw		
	1		imaging	Radiography	dog fracture 3 months pomeranian (pic) robertjones: but need surgery	
	1		surgery	Orthopaedics	TPLO	assisted surgery: patella displacement/tibial crest trasposition post sx left: post sx: rimadyl, tramado, morphine, cefazolin sulphazalazine
		1	euthanasia	cat pif thorax effusion		
		1	surgery	Declaw	cat 5 years - declaw	
	1		surgery	Dental		
	1		surgery	Dental		
	1		surgery	Spay		
			surgery	Lombectomy	dog basset hound; 11 years old lymphocitic plasmocitic granuloma.	
	1		necropsy	heart failure		
	1		necropsy	sudden death		
	1		orthopedics	dog fracture	robert jones bandage	
	1		neurology	Ataxy	general weekness + idiopathyc muscular ataxy	
			internal medicine	dog evans syndrom		
	1		surgery	Gastropexy	profilatic	saint bernard; 1 year old

Table_apx 4 - HSP clinical cases

Diseases		Dogs		Cats	
Cardiology		1			
Dermatology	demodex	2			
	ringworm	5	1 diagnosed confirmed		
	ear mites	1			
	alopecia	1			
	bacterial inf.	5			
Infectious disease	parvovirus	6		PIF suspects 3	
	distemper (suspect)	1			

Respiratory disease		25		8	
GI upset		24	6 parvo	10	
Parasitic diseases	tick disease	2			
	HW +	3			
Musculo-system		2		1	
Estomatology	dental cleaning	1			
Hematology	coagulopathy	2			
Ophthalmology		4			
Orthopaedics	osteomyelitis	1			
	pain	1			
Urology				2	
Behavior		2		2	

Figures



Figure_Apx 2- Feline intranasal route vaccination with killed vaccine.

Appendix 11

Sample form used at animal admission in the HSP shelter.

Appendix 12

Externship evaluation by Dr. Michael A. Buedel

Appendix 13

First presentation lecture of Shelter Medicine in Portugal

During the writing process of “Understanding Shelter Medicine” thesis, I had the good fortune to be invited by Grupo de Voluntários no Canil/Municipal do Seixal to participate in “ I Jornada sobre Reflexão sobre Boas Práticas” and give the first lecture about “Medicina Veterinária em Abrigos – Desafios e Perspectivas”, on November 7, 2009.



**Medicina Veterinária em Abrigos
Desafios e Perspectivas**

Tânia Frazão Santos
Faculdade de Medicina Veterinária, UTL

I Jornada de Reflexão sobre Boas Práticas
Rumos da Protecção Animal
7 de Novembro de 2009

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