

Chapter One

The Human-Dog Relationship: a Tale of Two Species

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Animals have generally played a great role in human ecological adjustment. Just as credible a reason as any for the domestication of animals is their use as pets. In other words, there is as much reason to believe that man's psychological needs were the primary cause for domestication of animals as that man needed to use animals for such material purposes as the saving of human labor and the satisfaction of a hunger for food.

Boris M. Levinson (1969)

It is common that different species of animals may share the same environment and often benefit from each other's presence. They may follow one another for food, or flee together even when only one senses the danger. In natural symbiotic relationships, one participant does not significantly alter the physiology of the other. This is not what has happened with people and their domesticated animals and especially the human relationship with companion animals.

Domestication

Domestication is a biological process; the artificial selection (by people not nature) of an animal's characteristics by breeding animals with the desired characteristics and discouraging, or prohibiting, the propagation of those animals without the desired characteristics (Darwin, 1859). This selective breeding alters

the frequency of certain genes in the breeding population. The genes themselves are not altered (mutated), only their frequency of occurrence. The desired attributes will now occur more often than expected.

Physiological processes and patterns of behavior are much less changed by selective breeding. Hence, the gestation period, size of the genital organs and social behavioral patterns of modern domesticated animals are basically the same as those of their wild ancestors.

Many of the economic, social and even aesthetic characteristics sought by people for their domesticated animals are more commonly observed in the younger individuals of the wild type. Breeding food animals like pigs and cows that retain their more juvenile form means having animals that do not expend energy on bone elongation, but more efficiently deposit more meat and fat on shorter bodies, which is, of course, what is desired. Initially, most domesticated animals were smaller than their wild ancestors, but later the domesticated forms were further manipulated to produce animals that were much smaller or even larger; examples include Shetland ponies and Shire horses, who are smaller and larger than their progenitors, and the toy breeds of dogs, like the Chihuahua or the Newfoundland or Saint Bernard, who are actually larger than any wild canid. Domesticated animals often have other attributes associated with the retention of juvenile characteristics. In the sexually mature adult this is known as neoteny or pedomorphosis (Campbell, 1966). Neoteny is either early sexual maturation or retarded development of adult features although the organism becomes sexually mature while retaining immature morphology, like thinner hair, shorter horns and smaller teeth (Price, 1984, 1998; Coppinger and Schneider, 1995).

Interestingly, neoteny is one of the ways living forms can evolve relatively quickly, for many inherited characteristics can be selected at the same time and the species can change with greater rapidity. It has been noted that human beings, *Homo sapiens*, have more in common with juvenile great apes, e.g. gorillas and chimpanzees, than with full grown ones. The ability to stand erect, relative hairlessness, lack of heavy brow and relatively short arms are characteristics of very young apes and people. As the ape matures, the pelvis rotates and forces the animal to stand and walk using its arms as well as its legs; the animal becomes hairier, a heavy brow ridge develops and the face, arms and body grow to the proportions recognized as the adult form. Human beings, however, never outgrow their infantile characteristics (De Beer, 1958; Montagu, 1962; Campbell, 1966, 1972).

In addition to infantile physical characteristics, humans possess many juvenile behavioral characteristics including staying with parents longer than the total longevity of most animals, and a need for touch and bonding more like what most animals exhibit only during their immature stage of development. The need to be part of a family even extends to a family oriented social structure that may persist for the individual's whole life. The fact that the great apes outgrow these juvenile behaviors and physical characteristics is in part why none have been particularly successful as pets, despite their genetic relationship to us. Apes and all the larger

monkeys are trainable and can be conditioned to tolerate the human way of life, but none thrive in it. Apes and the larger monkeys cannot remain house pets once they mature. In contrast, dogs thrive with people.

Promoting the breeding of carnivores that retain their juvenile attributes would encourage playfulness, and less aggressiveness, making them better companions and easier to handle. In addition, such a breeding program would also promote other juvenile traits usually considered more attractive. Most people find animals with wide eyes and short snouts pleasing. These are typically, features of the young. Many of the animals that are particularly enjoyed by our culture are those that retain some of the physical attributes of the young, like the seal, dolphin, and squirrel.

Animals were domesticated, for one reason or another, because we liked them. Therefore, many of today's domestic animals were created by selectively breeding animals that retained the traits of the young, e.g. cattle, pigs, dogs and to a somewhat lesser extent, cats. All of these retain many body characteristics and behaviors of the juvenile throughout their lives.

Perhaps a naturally occurring neoteny permitted humans to evolve rapidly away from their primate ancestors thus avoiding competition with them that we humans may not have survived. In many ways, cultures evolve by a natural selection process as well. Humans, with their juvenile qualities, maintain behaviors more typical of the young. Hence, they extend parenthood and closeness with each other, i.e. human social order and culture. Man, not dog, is man's first domesticated animal.

The ancestor of the dog

It is now generally accepted that dogs, *Canis familiaris*, were first tamed then domesticated from the wolf, probably one of the smaller subspecies of *Canis lupus pallipes* or the now extinct *C. lupus variabilis* (Clutton-Brock, 1995). The relationship between humans and dogs began in prehistoric times, some 12,000 years ago, about the time people started living in villages. Sheep and goats are traced back approximately 10,000 years, cats about 5000 (Morey, 1994).

As prehistoric peoples traveled from place to place in search of game and fertile lands, wild wolves undoubtedly followed, attracted by the prospect of an easy meal on the bones, uneaten food and even the human waste people left behind. At this stage the wolf was not so much loved as tolerated. An uneasy symbiosis must have developed. Wolves warned humans of approaching danger and may have even led early hunters to animals that both could eat. Taming occurred as individual animals were rewarded with food when they approached. Tamed animals could be captured and bred. Keeping the offspring of those animals, particularly those with the juvenile qualities people wanted, began the domestication process.

Dogs that accepted people as an innate response were bred, but they still retained much of the behaviors of the pack oriented animal. In time, dogs responded to humans as members of their pack and treated them more as their conspecifics (members of the same species). The conventional definition of a pack implies members of the same species, as the conventional definition of aggression implies a conspecific interaction. If we extend both these concepts to include ecological and social “conspecifics”, if not necessarily genetic conspecifics, we can explain a great deal of our interactions with domesticated dogs.

The first extension of the dog-human pack hypothesis would be that a dog and its owner (master) are a true social group. From the human’s point of view, the dog is a “member” of the family, indeed, most people who are dog owners specifically refer to their animals as a member of the family (Beck and Katcher, 1996). Most people intuitively respond to a dog’s “play-soliciting bow” or growl in much the same way another dog would. It is this preference to exist in a pack, dominated by a leader that forms the basis for many successful human-dog relationships. When there is a lack of a clear hierarchy or when the animal, not human, is the leader, we see problems in the family, including animal bite and inappropriate behaviors.

The rate and range of changes that distinguish the dog from wolf or even from one dog breed to another has been increased by selective breeding within relatively small populations. Dogs were bred to meet the demands of differing climates and roles (Coppinger and Coppinger, 1996, 1998). There is no one reason for the domestication or even keeping of dogs. Nevertheless, dog keeping is common around the world.

The dog population

The dog population in urban and suburban areas is composed of three interacting, and at times interchangeable, subpopulations: (1) pets that never roam without human supervision; (2) straying pets that roam continuously or sporadically; and (3) ownerless animals usually referred to as strays (see Chapter 2). Social attitude towards strays is ambivalent. On one hand, they are protected because society is unwilling to either socially or financially support animal control and, on the other hand, they are unfairly blamed by popular literature as the major cause of dog bite injuries (Beck, 1980).

Estimates of the total dog population come from local, regional, or national surveys and there is considerable variation in methods used. Most rely on surveys of consumer panels and estimate about 52 million owned dogs in the USA (Patronek and Glickman, 1994). The data from the only true statistical probability sample indicated that about 28% of USA households have at least one dog, with an average of 1.5 dogs, per household for a total estimated population of 41 million dogs (Crispell, 1994). In the USA, all estimates indicate that the owned dog population is decreasing (Patronek and Glickman, 1994). This may not be true in developing countries where the owned and stray dog population is believed to be

increasing. This may be because more people are moving in urban areas and resources may be more available.

Today, more than 61% of USA households have some companion animal, 39% have dogs - 31% have more than one (American Pet Products Manufacturers Association, 1999). In Australia, approximately 60% of the 6.2 million households have one or more pets; 53% of the households have either a dog or a cat (McHarg *et al.*, 1995). Dog, cat, and/or bird ownership in European households are 71% in Belgium, 63% in France, 60% in The Netherlands, 55% in Britain, 61% in Italy, 37% in the GDR, 70% in Ireland, averaging 52% for all the 17 European countries surveyed (Reader's Digest Association, Inc., 1991).

By contrast, there are relatively few studies of urban stray or feral dogs. Specific populations have been studied in Baltimore, Maryland, USA (Beck, 1973, 1975), St Louis, Missouri, USA (Fox *et al.*, 1975), New York City (Rubin and Beck, 1982), Berkeley, California, USA (Berman and Dunbar, 1983), Italy (Hansen, 1983), Newark, New Jersey, USA (Daniels, 1983a, b) and some areas in Mexico and the American southwest (Daniels and Bekoff, 1989).

As a general rule, straying pets are more common in high human density, low- to middle-income areas, especially where people have direct access to the streets (e.g. areas of low- to middle-income private housing or row houses). Ownerless strays are more common in low-density, low-income areas where there is shelter and fewer requests for animal control, such as around parks, dumps or abandoned parts of the inner city (Beck, 1973; Scott and Causey, 1973; Fox *et al.*, 1975; Nesbitt, 1975).

It is important to distinguish straying pets from ownerless strays, because they cause different problems for society and are managed or controlled by different means (Beck, 1974). Straying pets are best managed by encouraging and enforcing responsible ownership, while strays are controlled by capture and alterations of the environment, e.g. the boarding-up of vacant buildings and clearing dumps and urban lots (Beck, 1981).

One adaptation of unowned stray dogs in an urban environment is to behave like socialized pet dogs (Rubin and Beck, 1982). In that way they are indistinguishable from owned stray dogs and are tolerated as loose pets and not wild dogs - a form of "cultural camouflage". Therefore the differences between owned and unowned stray dogs are not easily observed without extensive study.

No country has an official census of their pet or feral dog population, although methods exist for those interested in animal control or public health (Beck, 1982; Bögel, 1990). There are also no precise figures as to the number of animals killed in animal shelters. In the USA, estimates range between 2 and 6 million for dogs and cats killed in animal shelters each year (Rowan, 1992). The popular press often quotes in excess of 12 million.

As the urban stray dog population comes mostly from the pet population, we assume the population of stray dogs is also decreasing. By domesticating the dog, people assumed responsibility for its survival, and like other domestic animals, the dog does not do well without the intervention of humans. In urban areas stray dogs

do not reproduce well enough to establish a wild population and so soon disappear if people do not abandon pets (Beck, 1973). One indication that urban stray dogs appear to be recruited from the pet population is the great variation of breeds, often like the owned population. In rural areas of developed countries and developing countries the dog population develops some uniformity (Perry and Giles, 1970; Scott and Causey, 1973; Nesbitt, 1975).

Social conflicts of dog-human contact

Most of the problems associated with animals in populated areas concerns dogs. The major issues associated with dogs in cities include animal bite, environmental damage, potential disease, and humane considerations for the animals themselves. These are real issues but there are also real solutions.

Dog bites

One concern about dogs in cities is that they may bite people, especially children. All of the USA studies using reported bite-rate data show the same pattern; people ages 4-19 receive about 20% of all dog bites (Harris *et al.*, 1974; Beck *et al.*, 1975; Hanna and Selby, 1981; Lauer *et al.*, 1982; Beck, 1991).

Contrary to the public's perception, in the USA the owned pet dog, not strays, leads the pack in bite rate. Dogs owned by the neighbor of the victim have the highest rate, followed by those owned by the family of the victim. Strays had the lowest rate. However, bites from strays are more commonly reported than bites from owned animals. Where there is good reporting of all bites, like in population based surveys or on military bases, non-owned or stray dogs account for less than 10% of all bites (Beck, 1991). One reason for the disproportionate "over-reporting" of strays is the perception that strays cause more disease, like rabies. Stray dogs may be perceived to be less healthy because they are ownerless or have less responsible owners because they let their animals run free. In either case, these dogs may indeed get less veterinary care, including appropriate vaccinations against disease, like rabies. Therefore, people tend to seek medical care and report the bite more frequently when bitten by an animal whose owner is not known; 50% of people bitten by dogs without known owners sought medical treatment compared to only 29% of people bitten by family owned dogs and 39% when the dog was owned by a neighbor (Beck and Jones, 1985).

Considering the patterns of dog bite injury, it is not surprising that a leash law, in one form or another, is common in many cities around the world. This simple regulation is a way of reducing animal bite and many of the problems associated with dogs. The law should set a maximum length of leash - about 1.8 m (6 ft) or less. People should not tether their dogs on ropes too much longer as longer leads can endanger the animals by being entangled.

Dog bite can be serious, as many infectious agents have been identified at the site of a bite (Talan *et al.*, 1999) and death from trauma has been reported (Pinckney and Kennedy, 1982; Borchelt *et al.*, 1983; Sacks *et al.*, 1989). Nevertheless, serious infection and fatal injury is rare. With the exception of the potential of rabies, the vast majority of bites are no more serious than the slips and falls associated with childhood - indeed, the injuries associated with routine child play are more common (Weiss *et al.*, 1998). But we should always try to minimize bite injury. The safest and most humane way to reduce bites from dogs is a public health policy that encourages having dogs that are well socialized to people and keeping dogs on a leash or always having them supervised when on public property.

In the USA, stray dogs continue to have little impact on human public health, be it from animal bites (Beck, 1991) or rabies (Beck *et al.*, 1987; Torrence *et al.*, 1995). For some people, ownerless dogs are part of the urban scene who live out their lives as wild canids. For others, strays are animals that must be captured as pests and removed from life on the streets, after which, they are usually killed, although some are adopted and become owned pets.

Owned dogs with undesirable behaviors, like biting, are more likely to be relinquished to an animal shelter. Compared with dogs having no unwanted behavior, dogs that exhibit unwanted behaviors daily, e.g. barking, chewing, hyperactivity, inappropriate elimination, aggressiveness toward other pets, and aggressiveness toward people, have a higher risk to be relinquished to an animal shelter, 1.3 versus 8.5 (Patronek *et al.*, 1996). Controlling the conflicts between the owner's expectations and the dog's nature is one of the important issues in public health and animal welfare. Avoiding owner-dog conflicts is one of the most efficient ways to lessen relinquishment of dogs to animal shelters and reduce dog bites.

Dogs and disease

With the exception of rabies, most of the diseases transmitted from dogs to humans do not attract much public attention in North America and Europe. However, dog waste, a perennial nuisance in cities, is more than just an esthetic problem. Dog feces in public areas allows parasite transmission from dog to dog and is also a human public health issue (see Chapters 4-10).

There are numerous studies establishing that dogs are frequently parasitized by *Toxocara canis* and failure to clean up after dogs seeds the environment with *Toxocara* eggs and it is now widely recognized that the ingestion of embryonated *Toxocara* eggs can cause human illness, i.e. toxocariasis or visceral larva migrans. The disease has two forms, an intestinal migration or ocular involvement (Glickman and Shofer, 1987; Chapter 8).

The best way to lessen the occurrence of parasite contamination is routine veterinary care. Animals that are routinely "de-wormed" do not pass contaminated feces, which is particularly important for those dog owners with young children.

Dog waste, apart from being a source of parasites is viewed as a kind of environmental pollution. To address this problem, most large metropolitan areas in North America and Europe have laws that restrict the activity of animals, especially dogs, in public areas. Most cities in the USA prohibit pets from entering restaurants or food stores or going on public transportation except for animals in enclosed carriers or service dogs assisting people with special needs.

One of the most common regulations to reduce dog waste in public areas is to encourage or require dog owners to have their dogs use the street, rather than sidewalk for defecation, the so-called "curb your dog laws". In this way people do not step into waste and the waste is carried to storm drains during street washing or rain. In addition, most cosmopolitan centers encourage or enforce clean-up after your dog when in public, "scoop laws" (Beck, 1979). Basic courtesy permits dogs and people to share the cities in ways that benefit both.

The social and health benefits of dogs in society

Dogs are present in almost all human settings and many share the human home as well. For some, they replace the children who have grown and moved away or perhaps were never born, and for others, they are playmates for the children still at home. In the USA, more than half of the families that have a dog also have children at home. At the very least, for some people, dogs afford increased opportunities to meet other people. We are beginning to understand this complex bond between pets and people; two species with the common goal of surviving and enjoying life together (Beck and Meyers, 1996).

People with good human contact are healthier than those who are isolated from others (Lynch, 1977; House *et al.*, 1988; Schone and Weinick, 1998). Because pet animals, especially dogs, are perceived as members of the family, pet ownership is one way people can be protected from the ravages of loneliness (Katcher and Beck, 1986; Beck and Katcher, 1996). Unlike talking to other humans, people experience a decrease of blood pressure talking to pets, indicating that they are more relaxed with them than with people (Katcher *et al.*, 1983; Baun *et al.*, 1984; Wilson, 1991). Even in the presence of unfamiliar dogs, people experience a temporary decrease in blood pressure (Friedmann *et al.*, 1983).

The psychological and physiological responses to association with animals appear to manifest themselves when people are asked to describe the perceived benefits for having a dog. More than 95% of dog owners list "companionship" and nearly half list "good for the family health" as their reasons for ownership. Nearly three-quarters include "fun to watch" and "like a child or family member" and 64% report the dog is a source of "security" (American Pet Products Manufacturers Association, 1999). Dogs providing a sense of security or safety appears to be especially appreciated for older adults (Erikson, 1985; Norris *et al.*, 1999). But this person's subjective perception appears to be founded in objective findings. In 1980, there was the first epidemiological report documenting the

value of pet ownership. A study of 92 people hospitalized after a heart attack found that 94% of those who happened to own pets were alive after the first year compared with 72% of those who did not own any animal. The ownership of any animal correlated with improved survival. A discriminate analysis demonstrated that pet ownership accounted for 2-3% of the variance (Friedmann *et al.*, 1980). While 2-3% may seem small, the impact, considering the frequency of heart disease, is significant and cost effective. A more recent and extensive follow-up with 369 patients also demonstrated that dog owners had a significantly improved one-year survival after an acute myocardial infarction than non-owners (Friedmann and Thomas, 1995).

A more recent study of the benefits of interactions with animals found that pet owners had reductions in some common risk factors for cardiovascular disease when compared with non-owners (Anderson *et al.*, 1992). Pet owners had lower systolic blood pressures, plasma cholesterol and triglyceride values. While pet owners engaged in more exercise, they also ate more meat and "take-out" foods than non-owners and the socioeconomic profiles of the two groups were very similar. It appears that pet ownership may reduce the risk factors associated with cardiovascular disease, possibly for reasons that go beyond simply an association with risk behaviors.

Serpell (1991) reported that dog owners experienced fewer minor health problems and increased the number and duration of their recreational walks. The effects persisted over the 10-month study period and there was no clear explanation for the results. Naturally occurring events in people's lives are enhanced because of animal companionship. For instance, people walking with their dog experience more social contact and longer conversations than when walking alone (Messent, 1983; McNicholas and Collis, 2000).

In one study, nearly 1000 non-institutionalized older adult Medicare patients were evaluated prospectively. Those subjects who owned pets appeared to experience less distress and required fewer visits to their physicians than non-owners. While animal ownership generally had value, the most remarkable benefits to health were for those who owned dogs (Siegel, 1990). Most of the people noted that the pets provided them with companionship and a sense of security and the opportunity for fun/play and relaxation. Animals allowed people to experience bonding. Siegel (1993) suggested that pets have a stress-reducing effect. The elderly often benefit the most from the companionship of animals (Dembicki and Anderson, 1996). Many indicators of life's satisfactions, including health and personal safety, decline after retirement but the decrease is significantly less among pet dog owners compared to non-owners (Norris *et al.*, 1999). Consequently, support has grown for protecting the right of pet ownership for older adults living in the community and encouraging animal contact for those in long-term nursing home settings.

The use of animals in therapeutic settings

Long before there was any evidence that animal contact enhanced physical and mental health, animals were being used in therapeutic settings, referred to as “animal-facilitated therapy” or AFT. Much of the early literature documents nothing more than fortuitous interactions with animals that happen to be present in a therapeutic setting (Beck, 1985; Beck and Katcher, 1996). The animals, mostly dogs, were originally included in the setting to provide the expected comfort traditionally associated with pet care. Often the best “medicines” are appropriate concentrations of what is generally beneficial (Beck and Katcher, 1984). From the very beginning AFT has paralleled the use of animals as pets and many of the therapeutic uses are extensions of the health benefits now recognized for those who own or interact with companion animals. The most common kinds of AFT programmes are: (1) institutionally based programs where animals either reside in the facility or are brought by visitors; (2) non-institutional programs for older adults where animal contact is facilitated in people’s homes; (3) service animals for the disabled in the home setting using specially trained animals, usually dogs; and (4) horseback riding (equine) programs providing riding directed towards physical therapy. The most common therapeutic animal is the dog. Today, AFT programs occur throughout the developing world.

A survey of 150 selected US and 74 Canadian humane societies found that 49 (46%) of the US and 49 (66%) of the Canadian society programs ran AFT programs. More than 94% used dogs and/or cats, 28% rabbits, 15% small mammals, 10% birds (excluding poultry) in their programs. More than 48% of US and 43% of Canadian programs consulted health professionals about zoonotic prevention. Nearly 10% of community-based and 74% of hospital-based programs had printed guidelines. Potential problems involve rabies, *Salmonella* and *Campylobacter* infections, allergy, and ringworm (Walter-Toews, 1993). Other zoonotic infections include *Cryptosporidium* and other protozoan (see Chapter 5) and cestode (see Chapter 7) infections.

While AFT has a good safety record, there are greater risks as programs involve more people. The potential exists for zoonotic infectious or parasitic disease, bite injury, accident, or allergy. Prevention can be addressed by: (1) proper selection of animals; (2) not including people who are allergic to animals; (3) having comprehensive infection-control programs in the setting; (4) having pet policies with advice from public health veterinarians; and (5) developing a surveillance and response program (Schantz, 1990). Future research will improve both the safety and efficacy of the use of animals in therapeutic settings.

Conclusions

Dogs have been part of human households ever since people began living in villages, some 12,000-15,000 years ago. Interactions with dogs may very well be one of our more successful strategies for survival. Today, dogs continue to play a major role in the lives of people around the world. While the medical history of our relationship with animals, including dogs, documents mostly the detrimental effects of animal contact, including zoonoses and injury from bites, there is a long history of healthy interaction. While animal contact carries risks, the frequency of most zoonotic diseases can be lessened, perhaps even eliminated, with animal management practices that would serve both humans and the animals themselves. Veterinary care to manage bacterial, viral and parasitic infections; mechanical restraints, like leashes and cages; selective breeding, responsible legislation, and owner education have made animal ownership a safe, healthy, and rewarding experience for many. Modern and sensitive public health policy would also help many enjoy dogs while protecting the public's health. There is substantial evidence to support the positive benefits of animal companionship for various segments of the population, especially children, the elderly, socially isolated, and the handicapped. More research needs to be directed to establish both the scope of these benefits and ways to channel the information more effectively to improve the public health of the community. In addition, more research is needed on how to better incorporate dogs for those in urban centers so both the animals and people can enjoy improved physical and psychological health.

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