THE ROLE OF THE DOG IN HUMAN MEDICINE

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MOTTO

There are two types of dog owner: the ones who openly admit that they let their dog in the bed with them, and the ones who deny it, but do it anyway.

Abstract: This article deals with the role of the dog in human society and its relationship to human health. A long and deliberate process of breeding has brought out the properties in the dog regarded by people as positive and beneficial. The dog model is used to study a number of phenomena, particularly vocal and body language, psychology and behaviour. Manipulation of the dog's genetic material allows for human disease to be studied as well. On the basis of his olfactory capabilities, the dog can detect a number of illnesses in humans. Canistherapy is highly effective in helping treat the symptoms of people with health disorders; and it complements classical pharmacological treatment for a number of illnesses. Dogs can help seniors regain their will to live by becoming a friend and confidant. Even a perfectly healthy person can benefit from having a dog around, helping him to keep fit and enjoy a higher quality of life.

Keywords: biology, canistherapy, diagnostics, genetics, illness, treatment, dog, prevention, health

Introduction

The dog has long been more than just another wild animal. Several thousand years ago man learned to use the dog's abilities; he deliberately cultivated various breeds, and over time the man-dog relationship has proved mutually beneficial. The dog provides man with many gifts: as a companion and protector watching over his property. It plays an important role in the hunt; and as a beast of burden transporting people and cargoes. It provides assistance in time of natural disasters and catastrophes. The dog substitutes for the senses and motor skills of people with health problems, and takes part in diagnosis and treatment of a number of illnesses. In some parts of the world dogs are seen as an animal for slaughter; its meat serves for nutrition and its skin for clothing. Recent intensive study has been made of canine genetics, communication, and psychology. The dog has even made it into informati-

on technology and robotics. This article focuses on selected issues of the dog's role in human health.

Material and methodology

The article is conceived as a meta-analysis carried out on the basis of printed and electronic information sources. It contains no original research data, but instead attempts to offer a more comprehensive perspective on the role of the dog in human society, its origins, manifestations, properties, and the benefits it brings to man.

The dog's origins

Today there is a great variability among breeds of dog, larger than between the varieties of other mammals. Finding their roots (or rather their ancestors) is very difficult. Houser ([on-line] 2004), Osel.cz ([on-line], 2009), and Wikipedia.org ([on-line], 2009) tell us that all breeds of dog probably come from around 10 original varieties. The domestication of dogs took place 15,000 years ago. During the period 10,000-8000 BC the main breeds had been separated out according to the properties that determined their use by people. One of the first roles for the dog was to assist at the hunt; later came tracking and running down the game, guarding the flock, amusement and companionship for humans, etc. Around 5000 BC in Mesopotamia the class entertained themselves with hunting using specialized dogs. Tracking dogs with very sensitive noses were bred later, around 3000 BC. About the same time in Tibet emerged breeds meant for work and guard duty. "Toy" dogs (especially for children) first appeared on Malta.

The dog and genetics

According to Houser ([on-line], 2007), the enormous variability in dogs is caused by a very few genes. Within the relatively brief period since the domestication of the wolf there have appeared an enormous number of dog breeds. Genetic analysis shows that the first domestication may have occurred in eastern Asia. Archaeologists have found evidence of domestication in Israel around 10,000 BC in the form of a puppy buried with a person.

The dog had to have a number of properties for man to choose him: it had like people, and be liked by them; it had to possess certain skills, and have the ability to learn more; and it had to understand man's verbal and non-verbal messages. The dog had to adapt to man in what it ate as well – it was able to beg for food, and to eat much of what humans eat, unlike the wolf. As the human expanded from the equator to the poles, the dog went with him. The dog had to adapt to survive inhospitable climatic conditions; among other things in its size, and its type and thickness of fur.

Today's breeds of dogs are very close genetically, and almost identical to those of their wolfish ancestors; most of them are able to cross-breed. Scientists are trying to figure out how small changes in the genetic code can so markedly affect the phenotype. One of the most likely explanations is that during the growth and development of the wolf cub into an adult wolf, it is not only size that changes but physical proportions as

well; this does not happen with cats, for example. The main cause of this variability is a change in the genes that affect the rapidity of growth in the individual parts of the body.

We can characterize the dog as a neotenic wolf. For example, in nature neoteny (or "cuteness" helps obtain care and protection for the young, towards which parents and other members of the pack behave differently than towards mature individuals. Even adult dogs retain some neotenic characteristics, which disappear in wolves. Besides appearance, there is also method of communication. Adult wolves use mimicry in their communications, and use barking mainly in their communications with their young. People better understand a bark than the do body language; therefore individuals that used barking in their communications even in their adulthood were preferred. The effects of genes are linked; selection emphasizing a single desired characteristic usually carries with it other traits as well – for example, wolf cubs of more tame personality may also have had different fur, or particular bodily proportions.

It is speculated that the ability of dogs to understand human gestures may be genetically based. Some tests show dogs even quicker to solve certain problems than monkeys.

Houser ([on-line], 2009a) and Budiansky (2002) tell us that over just a few generations two different lines were bred among Dalmatians (carriage dogs), which differ according to how they follow the team of horses. This they do not as a matter of training or in imitation of other dogs, but as a genetically encoded trait.

The systematic breeding of dogs began relatively recently, in the 18th century. Until then it was mostly intuitive negative selection that was applied (for example rejecting dogs with undesirable temperaments). The tracking and herding instincts of sheep dogs are genetically based, as is the love of water in retrieving and rescue dogs. Even the kind of animal a dog herds, for example sheep or cattle, is genetically determined. Deliberate "re-education" of these types of dog yields no result. Herding dogs sometimes react to the approach of a predator otherwise than a person would expect, assuming a play-like stance. If the attacker is a canine, it is able to understand these signals, becomes confused, and the hunting activity is disrupted.

These traits might not be coded by a single gene; instead they might be changed by a mutation in a controlling gene, which leads to occurrence or change in the concentration of some neurotransmitter. The change then decides whether a certain type of behaviour (following the herd) is triggered.

In recent times dogs have begun to play another important role in the lives of humans by assisting in the study of genetic mutations, which cause a similar illness in humans. Marcinková ([on-line], 2008) reports on Swedish research carried out at the University of Uppsala. The findings were presented at a conference on functional genomics in Innsbruck, organized by the European Science Foundation. Functional genomics is an area of science that describes the ways in which genes and their products, proteins, mutually affect one another in the complex network of living cells. If this mutual interaction is abnormal, a disorder may develop.

Dogs suffer from a number of illnesses similar to those of people, such as allergies, tumours, eye disease, and disease of the motor system. The possibility of studying the genomes of canine breeds is opening up, using the findings for possible

treatment of some human illnesses; many diseases may well occur on the same genetic basis. With dogs the search for the problem is simpler than with humans – it is easier to find the genetic defect leading to the development of an illness, because dogs were bred in the isolated populations of the individual breeds. If a defective gene in a dog is discovered and described, then it becomes easier to find its mutation in humans. For example, there is an analogy between human illnesses and impaired vision during the day that affects dachshunds, while golden retrievers are susceptible to cancer. Research on the genome of Springer Spaniels may contribute to better understanding of the development of breast cancer in women. Increased risk of malignant tumours of the mammary glands has also been found among other breeds, such as Cocker Spaniels, German Shepherds, and Boxers, which indicates that these breeds may carry in their genes an increased risk factor for this type of cancer. Identification of risk genes and understanding of the mechanism by which they affect the etiopathogenesis of illnesses may provide an instrument for timely diagnosis, treatment, and prevention of cancer among humans.

In Europe an organization called LUPA has been founded, within which 20 veterinary faculties from 12 countries have the task of collecting 10,000 DNA samples from purebred dogs. The purpose is to compare the genes of healthy animals with those affected by various illnesses of the type also found among people. Identification of the genes involved in the etiopathogenesis of illnesses, and the identification of genetic markers for canine illnesses, may be of help in lowering the high levels of inherited illness among purebred canines.

The dog and cloning

In genetics and other scientific fields cloning has become buzz word; a number of animal species have now been replicated in this way. Houser ([on-line], 2009b) notes that the first cloned dog was Snuppy in 2005 (Byeong-Chun Lee et al.). Lee (Seoul National University in South Korea) also took part in cloning the first transgenic dog – a female beagle named Ruppy (short for Ruby Puppy). Its genetic equipment includes genes from the sea anemone, which produce florescent proteins that glow red under ultraviolet light. Besides this beagle, four other dogs of hunting breeds have also been likewise "modified" in the same way.

Transgenic organisms have foreign genes that have been introduced, for example from bacteria, jellyfish, or sea anemone. This is more than just a spectacular demonstration for effect, but rather a technology that will allow a number of human illnesses to be studied on the canine model (cardio-circulatory, tumours, sensory, CNS, inherited developmental disorders, etc.). Cloning allows this artificial "construct" to be maintained and copied. However, the procedure brings with it a number of issues and mixed reactions, especially in the areas of ethics and law. Part of the public and scientific world place great hopes on cloning and transgenic organisms; others fear its abuse.

Petr (2003) and Houser ([on-line], 2003) point out some reasons for introducing human genes into animals. These are research on human illnesses, and possibilities that for various especially ethical standpoints cannot be applied to humans. We need organisms similar to humans, into which for example we introduce a defective copy of a

gene that causes a certain illness in humans. We can thus increase our understanding of the mechanisms of the outbreak and development of a disease, and develop effective vaccinations and medicines.

The dog, communication, and the canine mentality

The dog has been living alongside man for over 140 centuries. According to Koukal ([on-line], 2009) dogs can understand the sense of more than 40 words or sentences of its master's orders. Dog and man communicate on three basic topics: emotional state, social reactions (expressions of social status and territoriality), and their needs and desires. The number of repetitions of these is directly proportional to their excitement and urgency. Deeper tones and growls indicate warning and anger. High tones are expressions of concern and fear.

Ethologists are researching whether the dog in certain situations is possessed of feelings of guilt and shame, or fear of punishment instead. They were interested in whether the behaviour of a dog falsely accused of some transgression differs from that of one justly accused. De Waal (2006) and Houser ([on-line], 2008a) described the case of a female Husky that, while its master was away, tore to pieces everything made of paper, despite being repeatedly punished. When the man came back, the dog acted "guilty". So an experiment was made in which the owner of the paper objects tore them up himself, then let the dog in among them and left. When he came back the dog again acted "guilty", even though it had done nothing wrong. The dog behaved the same in both cases. "Guiltiness" is therefore probably an anthropomorphic projection; the dog was apparently afraid of the punishment that would follow after being found among the "incriminating evidence": scraps of paper and destroyed objects. Another explanation for the dog's behaviour is an attempt at appeasement, deflection of an attack by an individual that stands higher up in the hierarchy.

Lorenz (1997) and Houser ([on-line], 2009c) state that dogs are able to understand the mimicry and the voices of other members of the same or similar species – other dogs and wolves. This ability is lacking among the cat family, for example. Previously it was though that the dog understands man only generally, reacting to changes in tone and gesture. It turns out that the dog is able to understand individual words in speech, and even subtle differences between words. For example, one owner has 3 dogs with similar names – Harris, Paris, and Aris. The right one always reacts to the orders, without being otherwise influenced by gestures or facial expression.

Lorenz (1997) also notes that a dog can learn to distinguish between members of the family according to name or appellation (mommy, daddy), can elect a certain manner of behaviour upon order (it chases a cat around; its hair stands up, its expects resistance; it looks for a hedgehog in a pile of leaves, or looks for a squirrel in a treetop). Dogs are also capable of reacting to the sense of entire sentences, even though the individual words produce no reaction.

Coren (2007) and Houser ([on-line], 2008d) also speak of the dog's deductive and mathematical capabilities. A dog is able to compare quantities, to choose the dish that contains the most food, to count its young, or animals in a herd. One dog was to fetch some items but was unable to pick them all up at once, so he put one inside

the other and brought them back together, which may indicate a certain talent for geometry.

A dog can remember a number of items that a person has placed around in various places. He is then ordered to fetch them one by one. After the dog has brought the last object the master continues to give orders. The dog then sits and looks questioningly at the person giving such orders. To verify this, the experiment was repeated but this time the person did not know how many objects had been placed. The dog again was able to "add up" the objects. A different experiment was set up: a dog was shown an object, which was then placed behind a screen, and the same was done with another object. Unseen by the dog, one of the objects was then taken away or added: the dog recognized that the number of objects did not add up.

According to Coren (2007) a dog can be trained to associate words with individual objects. For example a dog learns to bring various things upon order. If we add to the objects the dog is familiar with an object he is not familiar with, and then we tell the dog to bring it using the word for it, the dog uses some kind of logical deduction and accomplishes the task, ruling out the items he knows one by one until concluding that the remaining thing he does not know must be the right one. He now associates the new word with the unknown item. If we order the dog to bring a new item that is not in the set, the dog will do nothing because he will not find the asked-for thing. The god uses the process of elimination (counting off), and from then on associates the new object with the new word. The association is conditional, and long-lasting.

Such experiments, however, are often difficult to realize in the laboratory, outside the dog's familiar (home) territory, where the dog behaves with interest and motivation. Another obstacle to independent evaluation is the fact that the dog's owners often exaggerate their dog's abilities. Some canine skills are possessed only by selected and especially capable individuals, while other skills (for example the mathematic skills) are possessed even by "untrained" dogs, and could therefore be inborn.

Lorenz (1997) notes that the domestication of wild animals usually leads to a decline in their intelligence. This trend has not been observed with the dog, however; although compared to wolves the dog has lost some of its abilities, it has gained others. The "IQ" of dogs varies between individuals of the same breed, and is also strongly dependant on the breed itself.

Lorenz (1997) and Houser ([on-line], 2008c) describe the aspects of canine communication. They seek an answer to the question of whether dogs have something similar to a human language, or only an expression of the emotions and social role of the animal; and whether dogs possess an audible grammar and syntax. According to recent observations dogs evidently have rules for how to connect and combine its vocal expressions: for example, dogs never combine growling and whining. It also depends on sequence. The resulting ensemble of sounds carries a different meaning than an isolated incidence of the individual parts of dog messages. For example a growl may mean a warning, or a defence of territory or food; a short bark reports on something new and interesting; the combination of a growl and a bark is an invitation to play, but reverse the order and it becomes a threat, an expression of determination to defend, or of fear and concern. The dog's sound expressions are complex and highly variable. At present we understand them very little, and the same goes for a dog's body language. The domesti-

cated dog is an example of neotony and natural selection; individuals that could communicate with man acoustically won out (unlike among adult wolves, which communicate with one another by physical gesture, and by barking with their cubs).

Dennett (1997) believes that the dog is very close to man in its ability to suffer; its perceptive abilities may exceed those of primates or of dolphins. For dogs the experience of suffering is very intense; unlike many other mammals (including the wolf) evidently because man has shaped dog "in his own image" so as to resemble him emotionally as much as possible. The dog responds to humans in a "human" way: he has a name, we treat him as we would a child; he is a kind of "humanized wolf" coming out of the process of intensive, initially negative selection over a period of 4000 generations (at least 12,000 years).

Even though the brains of humans and dogs differ in anatomy, during the process of breeding they became functionally more similar. Dennett (1997) uses the term "virtual machine" to label the superstructure to anatomical structure itself, and the similarities between humans and dogs in their expression of intense suffering.

There is speculation (Dennett, 1997; Houser, [on-line], 2005) over whether dogs are capable of abstract thought. Humans and dogs may have in their mind a certain image of the cat if a cat is actually present. But apparently the dog is not capable of working with this image in the abstract, in thought only, and to consider the cat as abstract object. It is possible, however, that abstract or theoretical thought (counting the sheep in the herd) was has been awakened by selection. Přeučil ([on-line], 2009) describes the extraordinary abilities of the Border collie. Experiments were conducted in which the dogs were supposed to fetch a certain object (a toy) after being shown the same object or a miniature. Some dogs managed the tasks right away without training. After brief training all the dogs brought the items correctly. The next task was much more difficult – they had to bring the objects after being shown a photograph, which only a fifth of the dogs were able to do. Even so, this is a remarkable result compared to those of primates or dolphins, which were unsuccessful. The result of thousands of years of deliberate selection and intercommunication allows the Border collie to very quickly understand what a person is asking of it, and try to please. This may be evidence of the dog's ability to think in an abstract way, which otherwise pertains only to humans.

The dog and information technology

Houser ([on-line], 2008b) reports on experiments carried out by Hungarian scientists from the University of Budapest. They recorded the barking of herding dogs in various situations (at play, fighting, solitude, danger). Samples of the sound recordings were fed into an artificial neural network which learned according to the bark to identify individual dogs, and the situation the dogs were in. The bark of being threatened was the most easily identifiable; recognition of individual dogs was most successful when they were at play, but practically indistinguishable when they were fighting. The artificial neural network was itself displaying behaviour close to that of a living person – for whom the signal of being threatened by a dog was also the most important. The variations on the dogs' barking carry with them much important information, and influence

human behaviour (if dogs are playing humans will join in; if they are fighting humans will separate them or flee to avoid being injured themselves).

Havrda ([on-line], 2001) describes an advance in robotics presented 10 years ago at the Robodex exhibition in Japan: the robotic dog Aibo. Its constructors and programmers studied the anatomy and physiology of human and animal bodies and their movements. A number of studies and models have been created on the basis of these observations, which were designed as expensive high-tech toys not only to entertain, but also to show how advanced information and communications technology has become. Over the course of time robots are acquiring credible human or animal proportions, and the old lumbering monsters are changing into gracefully-moving and communicating companions, which in the future might be able to carry out many household chores.

Canisterapie – healing by dog

Canistherapy is an adjuvant therapy based on the positive effect of dogs on the health of the client. However, it is necessary to take into account the seriousness of the diagnosis, the age of the client, the environment, and access to the patient (Hyperlink. cz [on-line], 2009).

Canistherapy is beneficial for persons with various types of health disorder. What is important to understand is that a dog is not a toy, it is a living being that has its needs which must be met; it must be cared for, and yearns for love from humans. If a dog is treated well it will behave just the same towards people with health problems as people without them (Doktorka.cz [on-line], 2001).

For those with mental problems canistherapy helps train the attention span, self-help, and can be a certain form of rehabilitation (exercise of the motor system, relaxation of spastic conditions, play, relaxation, development of the imagination, communication, responsibility, and self-confidence. With physically handicapped people dogs provide a form of rehabilitation and motivation; they strengthen communication, independence, feelings of security, responsibility, and bridge the divide between the patient and society and prevent isolation. Taking care of an animal diverts the mind away from one's own pain and troubles.

Through canistherapy persons with sensory impairment gain a greater sense of independence and security, as well as contact with other people, self-confidence, relaxation, and perception of risks. The vision-impaired use dogs to warn them of obstacles, gain information about their surroundings, and help them feel more secure in a crowd or an unfamiliar place. They are better able to make contact with their environment; they recognize that dogs differ in their pedigree, appearance, character, etc.; they learn how to take care of someone, and have less of a feeling of their own unimportance. Through canistherapy non-hearing people can again gain a higher degree of self-sufficiency and self-confidence. People with damaged olfactory apparatus use dogs to get timely warning of various dangerous substances nearby (gas, smoke). People suffering from damaged vocal cords are able to react through the dog using various orders conveyed by gesture alone or by gesture along with a certain sound signal (Doktorka.cz [on-line], 2001).

In the case of people with autism, the dog fulfils the role of intermediary (link) to the outside world, helps to maintain mental stability, eases loneliness, gives them

love, and calms them through physical contact. Canistherapy is effective in easing the symptoms of autism. For epileptics the dog is a companion and friend; it can be used in rehabilitation and play, and is stress-easing factor (lowering the frequency of seizures), increases the sense of overall security, freedom and autonomy. Some dogs are able to detect an approaching epileptic seizure and give warning while there is still time to react. In speech therapy canistherapy can be used to help train of correct pronunciation, expand the vocabulary, and help teach proper cadence of speech. For persons with a psychiatric diagnosis, a dog can help improve communication between personnel and patient, divert attention from their own illness, help with re-socialization, and emerge from passivity, apathy, and numbness. They also help in therapy for drug addiction and CAN syndrome (Doktorka.cz [on-line], 2001; Doktorka.cz [on-line], 2004).

Canistherapy also plays in important role in geriatric medicine. If a senior lives at home, care for a dog helps increase feelings of usefulness and responsibility; a dog offers love and a relationship, and imposes a regular daily routine. As a companion a dog substitutes for missing contact with people, increases feelings of security, relieves the loneliness, the sorrow and pain resulting from loss of a partner, improves communication with one's surroundings, and gives back to seniors a reason for living. If a senior is living in a retirement home, a dog can be a means of coming to terms with loneliness, escaping from nostalgia and depression, and substitute for the missing physical contact, tenderness and comfort, which is also reflected in better communication between clients and personnel. Canistherapy as a form of rehabilitation often leads to a reduction of the amount of medicines used (especially those with tranquilizing effects) because it relaxes the clients and helps them find better mental balance. A dog makes no distinction among people according to age, appearance, or diagnosis, but acts according to its internal value system – and it has a good strong relationship with a good master (Doktorka.cz [on-line], 2009).

The dog and diagnosis of human illness

Both expert and popular sources speak of cases in which dogs have been able to diagnose a number of serious illnesses in time to save their masters' lives. These are often cases which the human senses failed to detect, or else the detection methods used were insufficiently sensitive.

The server Pamenyzdravi.cz (2008) presents the case of a middle-aged woman in Great Britain whose Labrador diagnosed her breast cancer. Closer examination revealed a tumour, and the treatment was successful. The dog tried to touch the place where the tumour was; his behaviour was evidently instinctive, as he smelled the odour of the cancerous cells.

Pazdera [on-line], 2004), server Zdravi4u.cz ([on-line], 2004) and Darius ([on-line], 2004) sum up the findings of British clinicians published in the British Medical Journal on the detection of bladder cancer. Dogs can be trained to detect volatile substances in the urine of patient with cancerous illnesses of the bladder, which are of a different character than with bleeding, infection, or inflammation, which are the secondary characteristics of a disorder. Researchers came to this finding on the basis of the previ-

ous case of a woman whose dog was persistently interested in one spot on her leg – he sniffed it, and tried to take it between his teeth. Soon afterward a malignant skin tumour developed on the same spot, and the patient had to undergo an operation. Doctors tested 6 various breeds of dog (Spaniel, Labrador, Cocker Spaniel, mixed breeds) and for about six months the dogs were to smell the urine of people with bladder cancer. After training they were able to recognized 22 out of 54 cases; a diagnostic success rate of 41%. Scientists have tried to determine which volatile substances in the urine the dogs are detecting. They found that urine samples from cancer patients contained higher concentrations of formaldehyde, alkenes, and benzene derivatives, though not all of these are common to every type of cancer. Tumours, then, must produce some other volatile substances which the dogs are detecting.

Training dogs for this task has proven to be very complicated. At first the dogs were asked to smell urine samples containing cancerous tissue removed from patients. This method was abandoned because the chemicals used in the process (preservatives, disinfectants) altered the trace odours beyond the dogs' recognition. No chemical could be found that would reliably preserve the sample without altering its properties. But not using disinfectant put the dogs' handlers at risk. It was finally decided to work with fresh (more accurate) or dried, untreated urine. The dogs had to learn to ignore the odours that were not related to the tumour, for example in the case of menstrual blood, or diabetes. Likewise, aromatic or spicy food, drinks, or medicines can significantly change the properties of urine. The British study used samples from 108 healthy and ill patients of both genders.

In the case of 36 ill people the urine sample was taken shortly before their operation. The samples were cooled, divided up into smaller ampoules, and then frozen. They remained usable for up to 5 months. Before the tests the samples were thawed and the urine was removed by pipette and put onto filter paper in a Petri dish, which the dogs were then asked to sniff. There was one case of a man from the control group who had not been diagnosed with anything, but the dog evaluated his sample as positive. Later the man developed a kidney tumour.

These experiments are intended to help chemists identify the substances that are indicative of tumours, which will assist in timely diagnosis. Poor countries that cannot afford expensive laboratory methods (such as gas chromatography) will be able to use the services of canine diagnosis. It has been shown that dogs should be able to identify other types of cancer, for example of the intestines or skin; from the stool, perspiration, or breath.

Darius ([on-line], 2004) points out the fact that dogs exhibit uneasiness, and a desire to lick or sniff the place on the body of a patient who is developing a tumour. Even some untrained dogs will exhibit this behaviour. Another possibility is to use specially-trained dogs to search for people with tuberculosis, not only in the hospital, but among the general public.

The server Doktorka.cz ([on-line], 2006) and Lynch ([on-line], 2009) have presented the results of an American study that used dogs for timely diagnosis of malignant tumours even before they were discovered by today's advanced methods. Experts at San Anselmo, California trained 3 Labradors and 2 Portuguese water dogs. They were given breath samples from 55 patients with lung cancer, 31 with breast cancer, and 83 healthy

persons. The dogs correctly identified 99 % of the samples from lung cancer patients and 88 % of those suffering from breast cancer.

The server Doktorka.cz ([on-line], 2004) also published the findings of Canadian research using 60 dogs concerning the prediction of epileptic seizures in children. During seizures there is the danger of injury or suffocation. At first there were only guesses about the chances for dogs to be able to predict an epileptic fit beforehand. The Canadian scientists began to seek a relationship between the behaviour of the family dog and epileptic seizures in children. In the sample of 60 dogs, 9 of them (15 %) were reliably able to warn the family of a seizure several minutes to an hour before its outbreak, by whining, licking, and constantly attending to the child. Their success rate was 80 %. The dogs were not specially trained; they began on their own to spontaneously react after about a month living with the afflicted persons. The exact mechanism of their predictions is still unknown. It may possibly be minute electric charges in the brain of the patient which precede the seizure and might change the external parameters of the organism, which the dog perceives either by smell or sight. At present there is a canine training program intended to protect epileptics during the seizure itself; a project for seizure warning dogs is also underway. A weak point in the observation was the fact that the family of the ill child was reporting on the abilities of their own dog, and thus may have overestimated them. Therefore a similar study will be undertaken in controlled clinical conditions so that the predictive powers of dogs can be impartially verified.

The server Doktorka.cz (2004) also reported on the use of dogs in helping patients with Alzheimer's disease. One 62-year-old Israeli suffered from an early stage of Alzheimer's. Because he liked animals, he was included in a pilot project unique in the world for "pairing" animals with people. A female Collie was trained for him, and as a result his quality of life was much improved. The Collie always guides his disoriented master home, and gives him a certain feeling of security when moving around outdoors. It is more than just a guide dog, but also a guardian that watches over its man practically the entire day, motivating him to activity, and sounding the alarm if there is danger. Around a tenth of seniors suffer from dementia, and those that do feel very isolated and lonely. A trained dog can boost people's self-confidence so that they are able to conduct many tasks much as they could before the onset of disease, and communicate with their surroundings. Meanwhile the dog is constantly improving in his training, and becomes literally a member of the family. Dogs have been equipped with a device that is able to determine its position with the help of the GPS. If the master becomes lost or is not heard from for a time, the family can find out where he is. It is also possible to activate a "dog cellphone" which sends the dog an acoustic signal to bring the man home. Patients in the early stages of Alzheimer's disease can live a normal life thanks to these specially trained dogs. Without them they often find themselves in danger, and if they are not found within 12 hours after they disappear, they have greatly reduced chances of survival. The senior is also motivated to take care of the dog, but his family must keep tabs to make sure he is carrying out his routine tasks (walking the dog, feeding it, and giving it water).

The dog as healer and helper

The server Doktorka.cz ([on-line], 2000) gives a number of reasons why it is good to get a dog. For reasons not yet completely clear (some have already been scientifically proven and described, others await the same), a dog is able to perceive the incidence of negative factors in so-called geopathogenic zones and avoids such places, which could be taken advantage of by humans as well (finding a suitable place to rest or sleep). On the other hand, some animals (like cats) are actually drawn by such phenomena.

The dog has a demonstrably positive influence on the physical fitness of his master; it motivates him to take walks and other activity. This improves physical fitness and the condition of the motor apparatus, the circulatory and respiratory systems, reduces body weight, stimulates the metabolism, and removes a number of harmful substances and waste materials from the body, which helps prevent the development of cancer or metabolic illnesses. Emotional tuning and readjustment after suffering stress has an important influence on the harmonization of the motor system and mental processes. The calming of the nerves overlaps into the physical sphere, and positively influences the immune system; it is the prevention of more serious health problems known as the "civilization diseases", or more correctly, non-infectious diseases occurring on a large scale.

Today's hurried and over-technologicized society demands high performance from humans over long periods, which in time leads to social, psychological, and physical problems; in other words, disruption of the balanced, holistic model of health. To this add superficiality, alienation, anonymity, and lack of good interpersonal communication, which make the situation even worse. Getting a dog helps break down the barriers between people; at minimum the dog's owner becomes part of the community of "dog people"; he begins to take more interest in the lives of his fellow citizens and the community where he lives. He stops being indifferent to a number of negative phenomena that can threaten the safety of the community. For isolated people the dog becomes a dependable comrade and an avenue to search for friends or a life partner. The dog returns the love and care given to it many times, providing him with company and devoted friendship at any age regardless of status, race, gender, creed, or handicap. The owner must not forget the basic needs of the dog – drink, food, walking, health maintenance, vaccination, checkups, and a suitably stimulating environment. Even a "senior" dog has the right to a dignified old age and good treatment.

Conclusion

The dog has lived with man for over 140 centuries, during which many breeds have been bred, and the dog has become companion, protector, and helper of man. With developments and changes in our way of life, the role of the dog has changed, too. Today's science studies not only the origin of the dog, but his methods of communication, expressed in various situations, behaviour, and mentality. In information technology and robotics the dog is a model for the development and programming of artificial intelligence. The dog helps people whose health, lives, and property are threatened; it returns lost abilities to people with disabilities. Study of the dog genome and the introduction of foreign (even human) genes allows us to model a number of health disorders, describe

them, and find a suitable cure. Timely diagnosis of illness (especially tumours) thanks to dog's abilities allows the beginning of treatment and saves patients' lives. Canistherapy stimulates and assists the motivation of patients, relieves spasms, and psychological blocks; it increases the degree of independence, communication, self-confidence, security, and re-socialization of persons with health problems or diseases. For a healthy person as well, the dog is important, helping him to maintain physical, mental, and social health; this is especially true in the case of seniors. If we make an effort to understand the dog, we will begin to better understand ourselves as well.

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ROLE PSA (NEJEN) V HUMÁNNÍ MEDICÍNĚ

Abstrakt: Příspěvek se zabývá úlohou psa v lidské společnosti a její souvislostí s lidským zdravím. Dlouhý a cílený proces šlechtění psů vyzvedl vlastnosti, které lidé považovali za pozitivní a výhodné. Na psím modelu je studována řada jevů, zejména aspekty hlasové a tělní komunikace, psychiky, chování. Manipulace s genetickým materiálem psa dovoluje studium lidských onemocnění. Pes rovněž může na základě svých čichových schopností predikovat řadu chorobných stavů u člověka. Canisterapie významně přispívá ke zvládání poruch u osob se zdravotním postižením, napomáhá klasické farmakologické léčbě u řady onemocnění. Staří lidé díky psovi získají novou motivaci k životu, přítele a důvěrníka. I naprosto zdravý člověk může těžit ze vztahu ke psovi, a to udržením dobré kondice a vysoké kvality svého života.

Klíčová slova: biologie, canisterapie, diagnostika, genetika, nemoc, léčba, pes, prevence, zdraví