Problems associated with the coexistence of man and animals in urban areas

A. MANTOVANI, G. BATTELLI and R. ZANETTI
Istituto di Malattie Infettive, Profilassi e Polizia Veterinaria, Università di Bologna, Bologna Italy.

Introduction

Modern urban man shares to a varying extent his environment with some domestic or non-domestic animals. These, in turn, inhabit that same « urban niche » and assist the establishment of an association which results in positive and negative aspects.

A short review will be made here on various aspects of such a coexistence, as we feel that some of the present attitudes are wrong and, worse still, detrimental. In fact, we must often deal with two opposed detrimental attitudes: « zoomania », which pretends to impose animals by any means and everywhere, and « zoophobia », according to which no animals should be allowed in the urban environment.

This sort of « zoophobia » does not involve only wildlife and pets in the urban environment, but also farm animals which should also be banned as a source of various problems; yet, no suggestions are given on how to cope with man's need for animal foodstuffs.

In this connection, it is worth noting that newspapers and magazines often publish letters from people protesting about the presence of animal (mainly dogs, but also pigeons or other animals) in urban areas and blame them as being responsible for true or presumed responsibilities in the spread of diseases, environmental pollution and the like. Other letters are also published polemically and often unthinkingly in vehement support of animals on the basis of prejudicial emotional involvement.

The authorities themselves in various cities have been led by a proportion of public opinion to enforce relevant measures, according to which dogs are not allowed in city centres, nor are they allowed to defecate in public premises or to enter shops. It has been also proposed to install special « toilets » for dogs and to establish free access areas for them, though these solutions, at least in part, were not regarded as easily enforceable.

The different problems associated with the coexistence of animals and man in urban areas will now be briefly discussed, with special attention to those aspects which are relevant to the field of Veterinary Public Health, such as the spread of zoonoses, environmental pollution and different social implications.

Animals found in the urban environment

The animals which live in the urban area can be divided into four main categories [1]:

A) Pet animals, *i.e.* domestic and non–domesticated animals kept as pets (dogs, cats, monkeys, guineapigs, hamsters, mice, cage birds, tortoises, aquarium fishes, etc.);

B) Synanthropic appreciated by man (pigeons, swallows, sparrows and other birds); this group also includes squirrels and birds inhabiting city parks;

C) Synanthropic disregarded by man, as they are generally treated with indifference (seagulls, bats, lizards, frogs and toads, etc.);

D) Synanthropic disliked by man (mice, rats, cockroaches, in some areas the dog, etc.).

Each of these groups is a potential source of either beneficial or detrimental effects, which will be discussed.

Detrimental effects

These are represented by:

a) *Transmission of diseases.* — The World Health Organization [2] provides a list of over 200 zoonoses. Of these, only a proportion is really important, such as some infections that can be transmitted by the cat (cat scratch disease, dermatomycosis, rabies, salmonellosis, toxoplasmosis, tuberculosis); by the dog (dermatomycosis, hydatid disease, leishmaniasis, rabies, salmonellosis, tuberculosis); by rodents (dermatomycosis, lymphocytary choriomeningitis, salmonellosis); by tortoises (salmonellosis); by wild and domestic birds (psittacosis–ornithosis, salmonellosis).

Particularly hazardous may be monkeys and other exotic animals which may be carriers of exotic infections difficult to identify.

Lizards, frogs and toads are not a real problem. Bats may be a problem only where they are connected with rabies. Mice and rats are conversely able to transmit numerous diseases.

Each of the above–mentioned zoonoses should warrant separate consideration. We want to stress here that their diagnosis and control are often

made difficult by the lack of proper facilities and training of the medical professions. We wish also to stress that too often this problem is treated unrealistically, *i.e.*, either it is overemphasized or, otherwise, completely ignored.

b) *Bites, scratches and other lesions.* — In Italy, about 20,000 peoples [3] (*i.e.* one out of 2,750 inhabitants) receive antirabies treatment because of animal bites each year.

In our country, rabies is only encountered at the northern borders with Austria and occurs only in its sylvatic form. Fear of this disease is however widespread, so much the more because of several alarmist articles which from time to time appear in newspapers and magazines.

Though no precise data are available on this subject, it can be assumed that cases of biting and scratching by cats and small rodents are frequent and may result in the transmission of zoonoses such as pasteurellosis and cat scratch disease.

Animals living in town should neither bite nor frighten people. A special consideration should be given to exotic and wild animals kept in apartaments and gardens. It is highly desirable that these animals, which are virtually never bought for zoophilic reasons, but mainly for « exhibition », be never kept in houses, all the more so because their owners do not generally possess adequate information on how to keep them and also in view of other reasons connected with the possible transmission of zoonoses.

c) *Animal wastes.* — The pavements and the scanty green areas in our cities are often strewn with dog faeces which result in serious damage to both public decency and human and canine hygiene. Owners should do their best to minimize this undesirable situation. Our own opinion is that a society that tolerates nuisances such as traffic (dirtiness, noise, noxious gases, occupation of free spaces, motoring–mania) in the streets, smoking in public premises, spitting in the streets and public premises and the like, might well tolerate also dog faeces on pavements.

However, this obnoious situation should be avoided by any means in playgrounds because of health considerations.

Cats and dogs often search dust bins with consequent detriment to their hygiene and their owners' health; this is also highly undesirable for public decency.

Tower pigeons and other birds often dirty buildings with their droppings (endangering even the preservation of monuments) and other environments. The resulting animalization [4, 5] (*i.e.* the addition of such debris as faeces, skin scales, feathers and other organic matter) of the environment creates a habitat suitable for the growth of *Cryptococcus neoformans* and other pathogens. For this reason the pigeon population should be reduced.

Mice and rats are responsible for dirt (and transmission of diseases) and are, at the same time, a consequence of it. These animals also seriously damage public and private goods.

d) *Noise.* — Some dogs, if not suitable for the urban environment or unproperly kept, may be responsible for nuisance. This applies also to dogs and cats left in the house even temporarily. Cats in the breeding season may also be a nuisance, especially at night. Another nuisance is caused by some noisy pet birds. We feel it appropriate, in this connection, to recommend not to keep animals unsuitable for the environment and to educate owners on this point (*e.g.* big dogs should not be kept in small apartments).

e) *Use of feeds, medicines, etc.* — Another argument advanced against pets is the use of foods, medicines and other commodities essential to man.

If we consider that in Italy there are about 4.5 million cats and 4.5 million dogs, we can calculate a daily feed consumption of 2 million kg for dogs and 1 million kg for cats [1].

This totals about 12 million tons of food, which is an amount sufficient to meet the nutritional needs of about 3 million people.

In the U.S.A., 450 million dollars are spent yearly, which, otherwise used, could relieve the misery of about 75,000 families. The budget of firms manufacturing dog and cat food is 20 billion lire per year in Italy, 250 billions in Great Britain, 150 billions in the Federal Republic of Germany, 100 billions in France and 1,500 billions in the U.S.A.

Similar considerations apply also to medicines and other products for pets.

Such figures and facts are used by animal–haters to claim a strong reduction of pet animals.

Our opinion is that such an attitude is not completely acceptable by contemporary society. Apart from considerations of mental health and of the ecological usefulness of pet animals, we want to stress that wastes much more serious and detrimental to public health are associated with smoking, motoring, alcohol consumption, abuse of medicines, and even with the use of improper techniques in food production and preservation.

The abolition of pets to abolish their costs would lead us far beyond the reduction of all our expenditures and, if enforced alone, would attain dubious results.

We recommend not to exaggerate when suggesting expensive feeds and other products for pets, but to limit oneself to reasonable expenses.

f) *Abandoned animals.* — Too often dogs and cats are abandoned in the city streets, along the highways or in the countryside. The main reasons for this are that families often adopt dog or cat puppies without being aware of the responsibilities and difficulties that such an adoption implies. Later,

they get tired of having the animal at home, or have no possibilities to look after it during holidays. Stray dogs and cats, if not kept under control, may colonize urban and rural areas, where they breed and form populations of virtually wild animals which create problems from the public health and safety standpoints. Thus, they become a nuisance and a real danger for man, farm livestock and wildlife in the urban and rural areas.

Efforts should be made to avoid the adoption of animals that people are not prepared to keep responsibly, to sterilize females not intended for breeding, to dispose of unwanted litters and, above all, to eliminate unwanted animals by euthanasia and not by abandonment.

It should also be stressed, because it is often misunderstood, that dog-catchers are an important and appreciated part of the veterinary team: as a consequence they should receive adequate training.

Positive aspects

The positive effects include:

a) *Ecological balance.* — The towns which man has built, and is continuously extending, are running the risk of becoming terrible concrete forests where man remains the sole living being. Every animal, be it domestic or wild, every plant assists in reducing the feelings of alienation and isolation of urbanized man. Unfortunately, we often happen to see manifestations of alienation that rouse pity as well as worry, such as adults and especially children who are frightened by a dog, a bird, or an insect. In this case, it is no use suggesting that parents should better train their children by bringing them in contact with nature, because they will not do so. Instead, we should place at their disposal a fragment of nature, in the form of animals and plants, and hope they will acquaint themselves with and eventually enjoy them. Also, wild animals living in urban areas (pigeons, sparrows, blackbirds, jackdaws, swallows, bats, lizards, etc.) have the indispensable task to remind us that nature does exist and to enable us to remain in contact with it, and that the atmosphere is not polluted to such an extent that life can no longer exist.

Of course, urban environment should be « imposed » only on those animals that are biologically suitable for it, avoiding suffering and alienation to unfit animals. This would also avoid the disadvantages for man of sharing his life with such animals.

b) *Animals and mental health.* — Pets are extremely useful in helping young people to develop their personalities and sense of responsibility.

The competitiveness and stresses of modern life lead many people to seek the friendship of other beings outside their uneasy situation, *i.e.* animals.

In these cases, a sort of « symbiosis » is often established between man and animals, due to which man tends to treat animals as human beings and animals, in turn, to treat man as an animal for mutual completeness. Looking around, we notice that this type of association is rather frequent, and it would be desirable that such an association were more wide-spread to provide an alternative to other kinds of struggle against solitude and against nervous disturbances.

People lacking self-confidence may cure their complexes by keeping a dog, especially a watch-dog.

Dogs, cats, and sometimes birds and fishes have been successfully used in psychiatry, in that these animals can provide the liaison between patient and physician. Pets have been employed to treat mental disturbances (depression, behavioural troubles in children, etc.) when traditional treatments had failed. It must be borne in mind, however, that there exist cases in which animals (especially dogs and cats) suffer the influence of their owners' neuroses and complexes. Small animal veterinarians should give their attention to this « animal psychiatry », also with the purpose of exerting a beneficial influence on human behaviour.

c) *Other positive aspects.* — Other well-known useful tasks that animals perform for man must be mentioned here, such as the aid given to blind and disabled people by dogs: the benefits derived from keeping a dog by people suffering from heart disease or in need of exercise. The dog, in fact, obliges them to go out and walk. Finally, we must mention the extremely important role played by cats and dogs in ridding homes of mice and rats.

Conclusions

The negative aspects of urban coexistence of animals and man are advanced by animal-haters to support their campaigns against animals. These arguments cannot be ignored by any realistically minded person in order to prevent animals from being fought or tolerated unwillingly, whereas they should be considered not only as friends, but also as an important, beneficial part of the city environment. We feel that the controversy about the presence of animals in a town can result in their favour if policies of common sense, sound education and proper health measures are followed.

Summary. — The different aspects of the coexistence of man and animals in towns are discussed.

The animals living in urban areas are classified as: *a*) Pets; *b*) Synanthropic, appreciated by man; *c*) Synanthropic, disregarded by man; *d*) Synanthropic, disliked by man.

The detrimental effects are: *a*) Transmission of diseases; *b*) Bites, scratches and other lesions; *c*) Animal wastes; *d*) Noise; *e*) Use of feeds, medicines, etc.; *f*) Abandoned animals.

The positive effects are: *a*) Ecological balance; *b*) Animals and mental health; *c*) Other positive aspects.

A positive solution of the problem is sought which avoids both the zoomaniac and the zoophobic attitudes.

Riassunto (*Problemi connessi con la coesistenza dell'uomo e degli animali nelle città*). — Vengono discussi i differenti aspetti della coesistenza dell'uomo e degli animali nelle città.

Gli animali che vivono nelle zone urbane sono classificati come segue: *a*) d'affezione; *b*) sinantropi, simpatici all'uomo; *c*) sinantropi, indifferenti all'uomo; *d*) sinantropi, avversati dall'uomo.

Gli aspetti negativi sono: *a*) trasmissione di malattie; *b*) morsi, graffi ed altre lesioni; *c*) eliminazione dei rifiuti; *d*) rumori; *e*) uso di alimenti, medicinali, ecc.; *f*) abbandono di animali.

Gli aspetti positivi sono: *a*) equilibrio ecologico; *b*) ruolo degli animali nella salute mentale; *c*) altri aspetti.

Viene prospettata una soluzione positiva del problema, che eviti sia l'atteggiamento di zoomania, sia quello di zoofobia.

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Healt risks associated with animals in different types of urban areas: Present status and new ecological conditions due to urbanization

B. ROSICKÝ
Institute of Parasitology, Czechoslovak Academy of Sciences, Prague, Czechoslovakia

Animals in urban areas

The adaptation of animals to urbanized areas is associated with symbiosis, parasitism and other ecological phenomena connected with the existence of man. I shall omit an analysis of the evolution of domestication, domiciliation and other phenomena in the relationship of animals with human communities in different geographical environments. I shall confine myself to an analysis of the present state of urbanized landscape in relation to zoonoses and attempt to describe its global characteristics. There are a number of papers on modern towns but very few that analyse them for health risks associated with animals.

Before going further I propose the following classification:

a) Centre of town, characterized by an agglomeration of buildings used for economic and administrative purposes — mostly without parks, often without trees.

b) Pericentral part of town, containing continuous blocks of buildings, but already interspersed with greenery, larger areas covered with storehouses, workshops, factories, water reservoirs and streams.

c) Residential areas or sites covered with other buildings with adjoining greenery.

d) Peripheral part of town, characterized mostly by buildings and small houses mixed with various small industrial, agricultural–industrial, or purely agricultural estates, interspersed with fields.

e) Suburban recreation areas, often quite large, directly connected with the town, and surrounded by fields, woods, etc. and different types of agricultural activities.

The animal species found in the towns depend on the main occupations of their inhabitants and the size of the town.

Food–producing animals.

As recently as the last century, food–producing animals were kept even in the centre of many towns. Today, this is rare, but needs to be mentioned because of some new aspects of land exploitation, and it still occurs in some places in Europe today. According to the above classification, and in the areas *b*), *c*), *d*) and even in the centre *a*), there are farms keeping one or more domestic animals (cattle, sheep, goats) which are daily driven to pasture and returned to their sheds in the evening. In other cases food–producing animals are driven from such an urban area to a pasture for a season where they remain under the supervision of a herdsman.

In both cases the pastured animals are in contact with ecosystems from which they may become infected with different pathogens which they in turn may bring directly into the town. This may be designated as an agricultural type urban area, as seen in some countries in Africa and Asia.

Pets.

With the technological development of civilization, the inhabitants of highly industrial and economically advanced countries tend to keep various animals as pets. For some years the World Health Organization has paid attention to the public health importance of pets [1] which has also attracted the interest of epidemiologists [2].

Although many dogs and cats are used for working purposes, and in some cases for food, as was originally intended by their domestication, on a global scale, these two species represent the most popular pets which live in close contact with man and other domestic, synanthropic or wild animals.

Dogs fall into the following categories: *a*) working dog (army and police dog, watch–dog, hunting dog, gun–dog, sledge or draught dog); *b*) farm dog (including sheep dog, cattle dog); *c*) pet dog; *d*) stray dog (homeless dog); *e*) wild dog. Each of these categories plays an important role in the epidemiology and epizootology of some zoonoses occurring in urban areas.

Cats do not fall into such clear–cut categories and may be generally divided in *a*) home pets and *b*) stray cats. It should be borne in mind that most cats, even with an owner or a permanent place to live, are vagrant to a certain extent.

In many towns cats and dogs breed outside human dwellings. The relationship of man to dogs and cats since their domestication has been also influenced by religious customs in the different geographical regions.

Other pets kept in urban areas include some laboratory rodents (*e.g.* guinea pigs, hamsters, mice) and a number of wild animals, including various rodents of attractive appearance (squirrels, chipmunks, dormice) and also some species of carnivores, monkeys, marsupials, etc. An important group

of pets are birds, primarily parrots, canaries, turtledoves and jackdaws. Tortoises are also kept as pets in many countries. Less popular are different reptiles, snakes and lizards being rather a special hobby.

Over the years pets have become fashionable and this has inevitably led to the establishment of organizations and shops for their sale, with attendant public health problems.

Pets are kept in most types of urban areas *a*) to *e*) and are in contact with all types of people. Information on pets should therefore always be an integral part of epidemiological investigations.

Synantropic (commensal) mammals.

Numerous authors have attempted to define synanthropy. For example, Kucheruk's [3] definition is as follows: synanthropic animals are those species which regularly inhabit human settlements or human constructions (buildings, living quarters, storehouses, stables, cowsheds, etc. and places for the initial storage of agricultural products), where they form permanent or intermittent independent and semidependent populations. Studies on this relationship between animals and man have only recently been undertaken [3, 4]. Different species of small mammals and their ectoparasites, mosquitoes and sand–flies affect the epidemiological characteristics of certain diseases, particularly in urban and rural areas, where they invade even modern houses and adapt completely to the prevailing conditions. Since they are important carriers of zoonoses they represent a grave danger to human health.

Synanthropic mammals in urban areas are associated either with human dwellings (areas *a*) — *e*)) or with barns of domestic animals giving milk (mostly areas *d*) and *e*)). Thus we may speak about synanthropy conditioned by man or domesticated animals. Urban areas are also penetrated by wild animals.

The control of rodents in urban areas poses one of the most difficult problems of veterinary public health in particular and of animal hygiene in general.

Synanthropic birds.

There are fewer papers [5, 6] dealing with this phenomenon in birds than in mammals. Due to body structure, habitus and habits, their synanthropy cannot be as close as that of mammals. Despite this, in urban areas we encounter a phenomenon of possibly considerable epidemiological importance, namely, the dissemination of viruses, mycoses and also some protozoonoses.

The first important factor is the settling on buildings by birds in the close vicinity of man. For example, the presence of pigeons in many European

cities leads to possible direct infection with *Bedsoniae*, when dust from their nests penetrates directly into apartments [6] or they become a source of penetration of bloodsucking ectoparasites into apartments [7]. Another example: every year sparrows migrating to Iran for the winter flock to Pahlavi Avenue in Teheran and build their nests in the trees lining the street. This creates problems as pedestrians are usually forced to avoid the pavement and walk in the road with the traffic.

Sparrows, pigeons and crows contaminate food and disseminate ornithosis, and other birds may also import house dust mites of the family *Pyroglyphidae*, causing atopic allergy in man.

Rookeries may lead to the formation of synanthropic natural foci of some arboviruses, such as Japanese B–encephalitis, when colonies of water–birds become a permanent source of infection for the town's inhabitants. Rookeries play another role: the birds' droppings contain substances stimulating the development of *Histoplasma capsulatum* [8].

Synanthropic arthropods.

Synanthropic arthropods were among the first animals to colonize the dwellings of man and they have adapted themselves to live in the most modern buildings of today. Therefore, their hygienic importance is of constant concern to the health services.

In general, we may divide them into two large groups: *a*) synanthropic blood–sucking ectoparasites, such as mosquitos, bed–bugs, fleas, argasid and ixodid ticks; *b*) hygienically injurious species, such as members of the orders *Blattoidea*, *Diptera* and *Hymenoptera*. This group includes flies, which are a serious problem in regard to communal hygiene. It also includes poisonous species, such as some of the genus *Lathrodectes*.

In many countries of central Europe the ant *Monomorium pharaonis* has become a serious problem. It colonizes the most modern houses and has become a scourge in hotels and hospitals.

A very little known group which has been studied in detail only in the last decades, is mites. Various species may penetrate dwellings from the nests of their main hosts – synanthropic birds or rodents. They may appear in large numbers, especially during their seasonal swarming or when their usual hosts disappear or are reduced (departure of birds after their nests have been destroyed, eradication of rodents after deratization measures have been taken). Therefore, in order to combat them successfully it is necessary to know the source of their occurrence.

This group includes the red mite, *Dermanyssus gallinae*, a bird parasite common throughout the world. It occurs on free–living birds, but primarily attacks poultry (chickens, pigeons, turkeys, ducks), sometimes in great numbers. The mite *Ornithonyssus bacoti* penetrates into houses from synanthropic

rodents (genera *Rattus*, *Mus*). It is a nidicolous parasite which can migrate over long distances. Of the blood–sucking mites transferring to man from synanthropic rodents the species *Liponyssoides sanguineus*, known in the literature as *Allodermanyssus sanguineus*, should be mentioned. It is widespread in a mosaic pattern in the different countries of Europe, Asia, Africa and North America. Its epidemiological importance consists primarily in its transmission of the causative agent of rickettsial pox, *Rickettsia akari*.

Under certain circumstances soft ticks of the family *Argasidae* may enter human dwellings. In central Europe the most frequent is the tick, *Argas reflexus*, which penetrates into houses in large towns, particularly from nests of half–wild pigeons built on the cornices near windows, façades, lofts, etc. In recent years this tick has attacked man, largely because intensive eradication of large numbers of half–wild pigeons has deprived it of its natural host. Several attacks have been recorded in European countries [7]. Finally, ticks of the medically important family *Ixodidae* may also be passively imported into human dwellings.

Human dwellings are also inhabited by several species of predacious mites and some other species which are ectoparasites of insects. After transferring to man some of them may cause acute affections of the skin. Most important are mites of the genus *Pyemotes* belonging to the supercohort Tarsonemini, as described by Voukassovitch [9].

A special kind of mite colonizing human dwellings is that causing various allergic reactions of respiratory organs, such as atopic asthma. For example in Czechoslovakia about 20 % of humans suffer from allergies of different types, of which about 20 % again are allergic to house dust, the most widespread respiratory allergy after pollinosis [10]. As late as the beginning of the 1960, Spieksma, after introducing flotation methods, succeeded in recovering from dust the mite *Dermatophagoides pteronyssinus*, of which the extract had a similar response in a skin test as house dust allergen. The genus *Dermatophagoides* belongs to the family *Pyroglyphidae*, including minute mites (170–500 μm). These can be transferred by man, *e.g.* on freshly cut hair at hairdressers. On the other hand, they are common in birds' nests, and thus get into the air while carried on the body surface of their hosts (findings in town dust whenever pigeons are present).

Of the synanthropic mites the best known are those living in stored products. They are primarily the following genera: *Acarus*, *Glycyphagus*, *Tyrophagus*, *Cheyletus*. They are also quite abundant in apartments. Modern houses, especially those separated by a wide lawn in housing estates, may be infested with the mite *Bryobia rubrioculus*.

A number of other mites may be imported into human dwellings, but have very little effect on human health. This importation depends primarily on the environment of the dwellings.

Zoonoses in urban areas, their prevention and control

Zoonoses in urban areas vary according to the different groups of animals that live in various parts and types of towns. Contemporary literature lacks a comprehensive survey of zoonoses occurring in towns, but numerous single reports and occasional articles are available.

Zoonoses of food–producing animals.

In the type of agricultural town that exists in some regions of Africa, Asia, America and Europe, cattle zoonoses (brucellosis, tuberculosis, actinomycosis, dermatophilosis, etc.) occur. In tropical and subtropical regions diseases affecting buffalos should be considered, *e.g.* those caused by *leptospirae* and the agent of *tsutsugamushi* in the Philippines. In *Bubalus bubalus Sarcocystis fusiformis* is common. Sarcocystosis and other *toxoplasmid coccidia* should be studied thoroughly, primarily to find out to what degree they can cause disease in man.

In the agricultural type of town special attention should be paid to sheep and goats as possible carriers of serious diseases (Q–fever, Maltese fever, listeriosis, etc.). On a global scale, these species are more important carriers than cattle in urban areas as they have greater contact with man. They may also be reservoirs of some less frequent diseases of man.

A lesser role on a global scale is played by pigs, although in several regions, *e.g.* in tropical south–east and southern Asia they may be a source of viral infections (*Bunyamwera* group of viruses), Japanese schistosomiasis, sarcocystosis, and in tropical Africa of trypanosomiasis, etc.

Camels and horses kept both for work and pleasure are also important as sources of human dermatophytoses, and in ecologically or epidemiologically suitable regions they may be reservoirs of serious diseases, disseminating them in towns on market days and during the passage of caravans.

Poultry is primarily a source of avian tuberculosis, ornithosis and occasionally of some mycotic and virus diseases of man.

The incidence of infection with microsporidia *Encephalitozoon cuniculi* in rabbits reaches a high percentage (up to 100 %). The role of this pathogen in human pathology is still not clear.

Zoonoses of pets.

The dog, as the oldest domestic animal, is a reservoir of several serious human diseases, the first of which is rabies. Town dogs play a double role in its epidemiology: *a*) in numerous regions (south–east Asia), in connexion with the customs of the inhabitants, rabies is distributed in the populations of town dogs; *b*) wherever dogs are kept either as watch–dogs or pets, infec-

tion may spread from wild animals, *e.g.* in Europe from foxes (wild–life rabies).

The next very serious disease which may jeopardize man is echinococcosis (hydatidosis), which occurs in the Mediterranean towns and in some other regions, including South America. In recent years, whenever veterinary public health rules have not been observed, cases of echinococcosis of man and dog have been recorded in European cities.

The dog is a reservoir of many other, mainly sporadic afflictions such as leptospirosis, boutonneuse fever, kala–azar, opistorchiasis, etc. As the popularity of pet dogs increases, it is likely that visceral *larva migrans* (canine as well as feline ascarids *Toxocara* play an essential role) will acquire a greater importance in human pathology.

Only some breeds of dogs may be infected with *Brucella canis*.

Like dogs, cats may also be a source of wildlife rabies acquired from wild animals and of several epidemiologically less significant diseases. In recent years cats have been indicated as a source of toxoplasmosis of man. This opinion, expressed in many classical papers, is confirmed by negative findings in the Mongolian People's Republic, where no cats have been kept. Among other diseases that may be acquired from cats is a mycosis caused by *Microsporum canis*, a zoophilic dermatophyte, which frequently attacks man [11] (*e.g.* in Rome, Moscow and towns in eastern Bohemia). It evidently parasitizes primarily cats, although dogs are also frequently infected.

The role of various pet birds has been intensively studied [6, 12].

A possible mode of infection of some pets (in areas *a*) and *b*)) is the transport of the pathogenic agent through food (meat, fish, corn, water, carrots, hay, etc.). The store rooms of these foods are often inhabited by small mammals and the infection may thus reach pets from great distance.

Zoonoses of synanthropic mammals.

Many synanthropic mammals (rodents, lagomorphs, marsupials, insectivores, small carnivores and others) harbour agents of zoonoses with which man may become infected [1, 13, 14]. Knowledge of the ecology and behaviour of synanthropic mammals (mostly animal reservoirs of various zoonoses) provides information on how various natural foci [15–17] have been maintained in urban areas and on why some foci increase in size. Urban areas are not free from potential vectors like mosquitos, sand–flies, black–flies or mammal ectoparasites, (mites, ticks, fleas) and thereby remain as natural foci of diseases [18–20].

Apart from classical transmission from vectors to vertebrate reservoirs in urban areas the spread also occurs by the same routes as in natural foci: through contact (leptospirosis); food and water (tularaemia, dracunculosis);

by air (systemic mycoses), and by any combinations of these. For example, after outbreaks in sugar beet rafineries we know that even a fully cultivated area [21] is not free from elementary foci of tularaemia. One of the characteristic features of tularaemia in central and south–eastern Europe is the epidemics in sugar rafineries which are sometimes located in towns.

Zoonoses of synanthropic birds.

The high populations of synanthropic birds in recent years in many European towns have resulted in new epidemiological and hygienic complications. Large numbers of blackbirds and other synanthropic birds have led, *e.g.* in the gardens of Prague and even in new housing estates, to seasonal swarmings of the chigger mite *Neotrombicula autumnalis*, causing summer trombiculosis. Masses of trombiculid mites have occurred even in sites where deep layers of new soil had been heapened up or moved and yet the trombiculids, which are microcaverniculous at the adult and nymph stages, have rapidly adapted themselves and colonized these new sites.

Synanthropic birds also play a role in the transport of ticks to parks and gardens in towns.

Measures to prevent birds penetrating into urban areas are still not taken to the fullest possible extent and birds are regarded as an attraction in towns for tourists. Bird eradication is carried out on a limited scale only and the protection of buildings by nets is confined to the most valuable art monuments.

Synanthropic arthropods.

The control of insects and mites occurring in homes is very difficult. On one hand, the mites continually build up their populations in cleaned rooms by import from outside and on the other, the choice of insecticides suitable for use in human dwellings is relatively limited.

The general principles of insect and mite control may be summarized as follows:

a) to observe hygienic rules in living premises: regular cleaning by vacuum cleaner, airing and beating of bedding, speedy removal of remains of food, etc.;

b) to inspect unused premises, lofts, cellars, outbuildings, etc. and to remove from them bird nests, droppings, dead animals, and bat colonies; to restrict the penetration of small mammals and to take deratization in time;

c) always combine deratization and disinfection measures in order to prevent insect and mite penetrating into human dwellings;

d) to inspect stored products in homes, especially flour, cheese, dried fruit, etc.;

e) to inspect regularly granaries, and storehouses used for oils and food products in order to prevent swarming of mites. Samples containing 200 to 500 g of substrate should be collected from several parts of the store room: *i*) from places predisposed to mite occurrence, such as corners of rooms, the dividing line between wall and floor, cracks in the floor, leaking pipes, etc.; *ii*) different layers of food; *iii*) from remains of food, and the so–called sweepings of the floor.

Environmental health problems, their prevention and control

The problems of environmental health in urban areas are associated with: 1) water supply and sewage; 2) air pollution; 3) soil pollution; 4) synanthropic vegetation; 5) social problems and those relating to customs.

In all continents the poorer areas of towns are not always connected to the main water system. This results in a number of intestinal infections, as well as many parasitic diseases (malaria, schistosomiasis, filariasis, amoebiasis, etc.) [22]. Constant care about clean water wells in such regions is one of the principal prerequisites of health.

Another problem connected with water is the formation of breeding places of various mosquito species that are vectors of malaria, filariasis and arboviroses, and snails as vectors of schistosomiasis [23]. Epidemics of malaria, dengue, Chikungunya virus infection are well–know after monsoon rains in Indian cities. In the tropical rain zone in south–east Asia some diseases associated with abundant water may become a permanent phenomenon (mosquito–borne haemorrhagic fever, Japanese schistosomiasis in the Philippines, etc.).

Another problem of environmental health, associated with sewage, has become important even in highly urbanized and industrial regions of Europe. This is the increase in taeniasis cases in humans, and in cysticercosis in cattle, which is alarming [24].

The problem of the occurrence of pathogenic and nonpathogenic amoebas of the genera *Naegleria*, *Hartmanella*, in urban thermically and organically polluted water reservoirs [25, 26] or in sewage [27] has been little studied.

Air pollution is the subject of numerous important studies and from the aspect of environmental health it has been summed up in a number of WHO reports and publications on this subject.

Soil pollution, primarily by eggs and larvae of different parasitic helminths and with cysts of protozoans is a scourge of some towns [28, 29].

Histoplasmosis, cryptococcosis, etc., as well as dermatophytoses, caused by pathogenic fungi in soil are being studied anew as emerging new zoonoses. Vegetables from gardens and other plots, as well as small domestic animals, are under the constant supervision of health services.

Animals in urban areas as indicators of human health

The examples given above show that contemporary towns in different continents, as divided into areas *a*) to *e*), are inhabited by many different animal species, which may be carriers of zoonoses. The definition of zoonoses as « those diseases and infections which are naturally transmitted between vertebrate animal and man » [30] suggests that an infected animal may be an indicator of potential epidemiological situation or of sporadic occurrence of human infection. I would like to mention the well-known fact that a plague epidemic in a human population is almost always preceded by the death of rats (*Rattus rattus*). I was personally able to verify this fact during a small epidemic of plague in Vellore in south India in 1964, when the first cases occurred in labourers at a grain market shortly after the death of rats.

Well established methods and techniques for zoonoses surveillance programmes have been recommended to epidemiologists many times by WHO. The detailed division by Rosický [31] into survey of fauna, ecological investigation, investigation of ecological and socioeconomic conditions, estimation of natural foci and their structure and final analysis of all data and evaluation of anti-epidemic measures, also applies to urban areas.

Zoonotic and parasitic infections are difficult to detect in many urban areas (especially those under *c*), *d*) and *e*), mostly in tropical and subtropical zones. Diagnosis is complicated by multiple infections and the advanced stages of chronic parasitic diseases. Naturally the higher the concentration of different animals and the higher the number of different domestic and synanthropic species, the greater is the risk of outbreaks and spread of zoonoses among the human population. The health of animals kept in towns, mainly those which can be directly influenced by man (*i.e.* domestic animals and pets) is a prerequisite for human health. The public health service registers primarily common diseases, but medically less known or sporadically occurring diseases, such as many zoonoses, require constant surveillance.

In this connection the standard of the veterinary public health services is of the utmost importance. Wherever the veterinary service is oriented only to individual treatment of the sick animal, without any systematic protection of breeding and planned sanitation of animals and of their whole populations, as is the case in countries with only private veterinary services, the epizootics occur more easily. Moreover, in many cases urban inhabitants

cannot afford such veterinary services. In contrast to this situation, a state veterinary service considers the protection of healthy colonies of all animals, the safeguarding of territory against zoonoses and sanitary measures for complex prevention programmes, to be its major task. This system proved useful for urban areas with a very diverse composition of animal populations.

Veterinary public health services should therefore take care of animals bred in towns and medical services should be concerned with health protection of breeders and persons who are in contact with animals.

Even in a number of modern towns in western Europe, for example, in Geneva, cattle or sheep graze in pastures in residential areas (type *b*). Green areas are used most effectively in this way. A similar situation may be seen in many international airfields, on the grass strips between runways.

It should also be borne in mind that many towns in different continents are still centres for animal markets, pet exhibitions and sport events. Even today a number of towns are visited by caravans from remote regions.

All these link natural foci of diseases in rural and urban areas.

Today meat, dairy and other food products of animal origin are imported into towns not only from the immediate neighbourhood but also from other continents. The importation of fish has also increased enormously. All this requires strict veterinary control and WHO/FAO have recommended appropriate measures (meat hygiene, milk hygiene, food hygiene, etc.).

The public health situation in towns is still more influenced by tourism, the transport of domestic animals and the importation of different pets.

Other problems

Other phenomena in urbanized regions should be taken into consideration. One is the existence of zoological gardens in most cities. Keeping exotic animals in cages or enclosures may pose various problems for veterinary public health. The animals, weakened by breeding in unnatural conditions, easily become a source of viral, bacterial, mycotic and parasitic diseases spreading to both synanthropic animals and man. Cases have been reported of tuberculosis, brucellosis, leptospirosis, psittacosis, etc.

In relation to veterinary public health specific conditions in urban areas are also created by extensive slums on the peripheries of cities. Statistical data of the World Bank in 1975 showed that 80 % of poor inhabitants, *i.e.* approximately over one-half of city dwellers in the world, live in hovels without any hygienic equipment, electricity, heating, etc., thus posing grave public health problems.

Other problems arise from industrialization and mining activities which result in suitable hatching and breeding sites of blood-sucking arthropods,

in the occurrence of reservoir animals of leptospirosis in mined regions, in combination with dumps, water surfaces and town garbage pits.

The advance of urbanization thus poses many public health problems which need to be systematically analysed, and the consequent diseases monitored and controlled. Based on the occurrence of animals in urban areas and the evolution of their diseases, the present situation provides a valuable tool for the prognosis of zoonoses in towns in different parts of the world.

Summary. — For different reasons urban areas are colonized by numerous animal groups. From the aspect of the incidence of zoonoses the following animal groups are primarily significant: 1) food–producing animals; 2) pets; 3) synanthropic mammals; 4) synanthropic birds; 5) synanthropic arthropods. Certain species live in central parts of urban areas which the A. attempts to classify, and particularly in suburban areas which serve for recreation of town inhabitants. From the aspect of the occurrence of different animal species the A. points out the significance of various parts of urban agglomerations.

Riassunto (*Rischi sanitari relativi agli animali in diversi tipi di ambiente urbano. Situazione attuale e nuove condizioni ecologiche legate all'urbanizzazione*). — Per diverse ragioni le aree urbane sono colonizzate da numerosi gruppi animali. Dal punto di vista dell'incidenza delle zoonosi, i seguenti gruppi animali rivestono un'importanza primaria: 1) animali utilizzati per la produzione di alimenti destinati all'uomo; 2) animali d'affezione; 3) mammiferi sinantropi; 4) uccelli sinantropi; 5) artropodi sinantropi. Determinate specie vivono nelle zone centrali delle aree urbane, delle quali l'A. tenta di dare una classificazione, ed in particolare nelle aree suburbane destinate al tempo libero e ricreativo degli abitanti delle città. Dal punto di vista della presenza delle diverse specie animali, è posta in rilievo l'importanza delle varie parti dell'agglomerato urbano.

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