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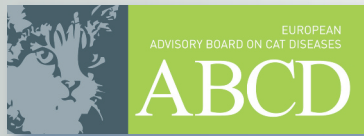
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PREVENTION OF INFECTIOUS DISEASES IN CAT SHELTERS

ABCD guidelines



Karin Möstl, Herman Egberink, Diane Addie, Tadeusz Frymus, Corine Boucraut-Baralon, Uwe Truyen, Katrin Hartmann, Hans Lutz, Tim Gruffydd-Jones, Alan D Radford, Albert Lloret, Maria Grazia Pennisi, Margaret J Hosie, Fulvio Marsilio, Etienne Thiry, Sándor Belák and Marian C Horzinek

Overview: Recommendations are given in relation to infectious diseases in rescue shelters. The ABCD recognises that there is a wide variation in the design and management of shelters, and that these largely reflect local pressures. These guidelines are written with this diverse audience in mind; they point to the ideal, and also provide for some level of compromise where this ideal cannot immediately be attained. In addition consideration should be given to general requirements in order to optimise overall health and wellbeing of cats within the shelter.

Housing: Compartmentalisation of the shelter into at least three individual sections (quarantine area for incoming cats, isolation facilities for sick or potentially infectious cats, and accommodation for clinically healthy, retrovirus-negative cats) can facilitate containment of a disease outbreak, should it occur.

Standard of care: Incoming cats should receive a full health check by a veterinary surgeon, should be dewormed and tested for retrovirus infections (feline leukaemia virus [FeLV] and/or feline immunodeficiency virus [FIV]) in regions with high prevalence and in shelters that allow contact between cats. Cats which are not rehomed should receive a regular veterinary check-up at intervals recommended by their veterinarian.

Vaccination: Each cat should be vaccinated as soon as possible against feline panleukopenia virus (FPV), feline herpesvirus (FHV-1) and feline calicivirus (FCV) infections.

Hygiene: Adequate hygiene conditions should ensure that contact between shedders of infectious agents and susceptible animals is reduced as efficiently as possible by movement control, hygiene procedures of care workers, barrier nursing, cleaning and disinfection.

Stress reduction: Stress reduction is important for overall health and for minimising the risk of recrudescence and exacerbation of infectious diseases. In general, a special effort should be made to rehome cats as soon as possible.

The shelter situation

Rescue shelters are considered a place where cats are kept temporarily until the legal owner or a new guardian is found or they are euthanased. The ABCD states clearly that keeping cats in shelter situations should be avoided as far as possible. Cats have evolved to become solitary territorial predators. The situation in a rescue shelter is not conducive to their wellbeing due to the progressive accumulation of infectious disease agents and the high animal density. The crowding stress of the shelter environment – noise, odour and sight of other cats, potential aggression – is immunosuppressive. Therefore, we at the ABCD strongly recommend that a rescue shelter should be a place of last option – with attempts being made to rehome unwanted cats, and especially kittens, without recourse to a shelter. However, where necessary, good practice should be adopted to minimise the side effects.

The special situations in boarding catteries (a place where cats are put temporarily while their guardians are on vacation or business), multicat pet households (where people intentionally keep more than one pet cat), cat sanctuaries (where rescued cats are kept until they die) and breeding catteries (where cats are intentionally bred) are not considered in these guidelines, although aspects of hygiene will also be applicable to these scenarios.

In shelter situations, infectious diseases spread frequently and are difficult to prevent for the following reasons:

- ❖ According to regional situations, in some or even many cases all incoming cats must be accepted.
- ❖ Cats may be persistently/latently infected with infectious agents.
- ❖ High turnover of cats reside alongside long-term residents.
- ❖ Often a no-kill policy is maintained.
- ❖ Concurrent factors like stress, poor nutrition, etc, facilitate spread of infectious agents and development of disease.
- ❖ Shelters are often short of money, resulting in crowding, inadequate hygiene and vaccination measures, and lack of testing for infectious diseases.
- ❖ Persons who work in shelters are highly motivated but often untrained in hygiene and disease management (the veterinary surgeon is often responsible for such training).

In order to minimise the risk of infectious disease a preventive management programme should be implemented which considers possible routes of infection and keeps the dose of pathogens as low as possible. Measures aimed at reducing the spread of infectious diseases include regulation of housing conditions, quarantine, good husbandry, testing for infectious diseases, vaccination, good hygiene management and stress reduction.

Housing recommendations/ accommodation

Good building design is essential for infectious disease control.

Individual sections

Compartmentalisation of the shelter into individual sections can facilitate containment of a disease outbreak, should it occur. In general, at least three, and eventually four, separate areas are required:

- ❖ Quarantine area for incoming cats.
- ❖ Isolation facilities for sick or potentially infectious cats.
- ❖ Accommodation for clinically healthy, FIV- and FeLV-negative cats.
- ❖ Accommodation for pregnant and lactating queens and their kittens.

Quarantine area for incoming cats

In state-of-the-art shelters, the housing is such that all cats are in quarantine essentially. In shelters where cats have to be kept in less than ideal conditions, cats which are not (re)-homed sooner should ideally be kept in quarantine for a minimum of 3 weeks (to protect against the risk of cats incubating FPV or FCV infections or reactivating latent FHV-1 infections and while the vaccine takes effect). In terms of the risk of FIV and/or FeLV infection, where all incoming cats are routinely screened for these retrovirus infections (eg, in high-risk areas) the quarantine should ideally not be shorter than 6 weeks (the period for FIV seroconversion and for becoming positive for FeLV antigen may be unusually long). Cats showing any signs of infectious disease should be moved immediately to the isolation facilities.

Isolation facilities for sick or potentially infectious cats

Cats showing signs of infectious disease or testing positive for an infectious agent (such as FeLV) must be isolated. Isolation areas have to be separated strictly from the quarantine area and other residents, preferably in a separate building.



Figure 1 Outdoor area adjacent to accommodation for healthy cats. 'Tierschutzkompetenzzentrum Klagenfurt', Austria, courtesy of Dr Marina Zuzzi-Krebitz and MMag Alexander Zuzzi

Accommodation for healthy, FIV- and FeLV-negative cats for adoption

Rooms housing small groups of cats (testing negative for FeLV and FIV infections and vaccinated against FPV and upper respiratory tract disease), potentially with an adjacent outdoor area, are ideal (Figure 1). Fencing must be sufficient to ensure that interactions with other animals (including birds) are prevented. Cats must have access to fresh water and shade, as well as protection from rain and cold weather, and should have no visual or auditory contact with dogs, as exposure to dogs has been identified as an important stress factor.¹ To facilitate adoption, potential new owners should be able to view the cats, but windows or doors to the viewing area should be Perspex or glass, not wire mesh.

Accommodation for pregnant and lactating queens and their kittens

Pregnant and lactating queens and their litters should be housed in a separate area. Each queen needs a separate pen, and no other cat should be allowed to share it. Ideally, these cats should not be housed in a shelter but, rather, with guest families organised and facilitated by the shelter.

Facilities and equipment

At the entrance to each section facilities for hand washing and cleaning coveralls are needed. Ideally there should be washrooms where the carers can wash hands (Figure 2). Hand and equipment disinfectants should be easy to use. Overshoes should be provided or, failing

European Advisory Board on Cat Diseases
The European Advisory Board on Cat Diseases (ABCD) is a body of experts in immunology, vaccinology and clinical feline medicine that issues guidelines on prevention and management of feline infectious diseases in Europe, for the benefit of the health and welfare of cats. The guidelines are based on current scientific knowledge of the diseases and available vaccines concerned.

The latest version of the guidance provided in this article is available at www.abcd-vets.org



Figure 2 Washroom at the entrance to units. 'Tierschutzkompetenzzentrum Klagenfurt', Austria, courtesy of Dr Marina Zuzzi-Krebitz and MMag Alexander Zuzzi

this, a footbath of disinfectant should be placed at the entrance/exit of the quarantine area and the isolation facilities (see 'Hygiene recommendations' later). Equipment for cleaning, disinfecting, feeding, etc, should be available for each area and be kept strictly there. It is recommended that different colours of food and water bowls, litter trays, beds, etc, are used, according to the area, to facilitate identification.

Corridors should have non-porous surfaces with easily disinfectable, rounded corners. Any flooring within the indoor facilities and any furniture should be of a type that can be cleaned easily (eg, no carpets).

Each area, especially rooms for accommodation, must include a sufficient number of litter trays (one for each adult cat, plus ideally one extra), food and water bowls, beds, scratching posts, toys and hiding areas. Litter trays should be placed away from food and water bowls.

Cages should only be used for medical/surgical reasons and routinely for the quarantine period; regional legislation must be considered (including that determining adequate cage size).

In general, in all accommodation, attention must be paid to ensuring a suitable environmental temperature (15–21°C),² good air quality (10–12 air exchanges per hour), and prevention of noise and other unnecessary stressors (for details see references 3 and 4).

Animal density

Over millions of years, cats have evolved to adopt a solitary lifestyle. Thus, animal density in rescue shelters should be kept as low as possible, as the prevalence of pathogenic microorganisms, and therefore infectious disease, is often correlated with population density and size. In ideal cat shelters, cats are

The ABCD recommends keeping groups of no more than three cats per room, otherwise the risk of cross-infection increases dramatically.



housed individually or only with cats from the same original household (which is particularly important in quarantine and isolation accommodation). Groups should be kept as stable as possible, as far as this is compatible with the turnover/adoption of cats by new owners. Kittens should be kept in a special quarantine with only their littermates and no contact with adults other than their queens. High animal density does not only increase the risk of infectious diseases, but may also produce stressful situations.

In terms of minimising stress, no formula for the recommended number of cats per group can be given, as additional elements like environmental enrichment and the quality of care have great influence. With respect to management of infectious diseases it is recommended that groups are kept as small as possible. For coronavirus infections, for example, it is well known that the prevalence is significantly higher in multicat situations compared with single cat households. In catteries and shelters with more than six cats this infection is virtually always present.⁵ The ABCD recommends keeping groups of no more than three cats per room,⁶ otherwise the risk of cross-infection and its consequences increases dramatically.

Standard of care in the management and prevention of infectious diseases

Various pathogens affecting cats are ubiquitous and, therefore, introduced frequently into shelters. For example, in a rescue shelter in Belgium, prevalence rates for FHV-1 and FCV infections of 20.1 and 33.1%, respectively, were found, and coinfections with both viruses were found in 10% of cases.⁷ In UK shelters, the prevalence of FCV infection is approximately 30%.^{8,9} Pathogens may be shed intermittently or continuously over prolonged periods of time in the absence of clinical signs. In the shelter environment rapid and efficient spread may occur as early as the first week after introduction of incoming cats.¹⁰

Careful observation and inspection of the health status of cats in a shelter, especially new arrivals, and testing procedures are essential in order to detect infectious (and other) diseases at an early stage. Ongoing training of staff members is of great importance not only for ensuring adequate management measures but also in respect of handling prevention of infectious diseases.

Zoonotic infection

Care workers should be instructed about the unlikely, but possible, risk of zoonotic infection, especially rabies. In rabies-endemic areas stray and feral cats should always be approached with caution.



Standard of care for incoming cats

Each incoming cat should receive a full health check by a veterinary surgeon (eyes, ears, nose, mouth, teeth, lymph nodes, heart, lungs, abdomen, limbs, claws, tail, skin, temperature, general condition). Sedation may aid examination of difficult cats.

Cats should be specifically checked for gastrointestinal, respiratory, and dermatological problems as these are commonly contagious and should be diagnosed and treated immediately.

Every cat should be checked for the presence of a microchip. If no chip is detected, the cat should be chipped.

Incoming cats older than 4 weeks should be dewormed and treated for external parasites. In areas endemic for heart worm, cats should be tested for this infection and placed on regular heart worm prevention.

Every cat in a shelter should be neutered.

Details of all medical care should be recorded and stored.

Arrival in the shelter is always a stressful event. Stress should be minimised because it can result in exacerbation (eg, FIP) or reactivation (eg, FHV-1 infection) of infectious diseases.

Ideally, cats should not be euthanased unless in moribund or terminal condition, but if appropriate treatment is not available and cats are suffering, euthanasia should be considered for humane reasons. It should also be kept in mind that a long-term stay in a shelter may, for many cats, impact on the quality of life. The ABCD does not recommend the euthanasia of healthy FIV- or FeLV-infected cats, unless it is not possible to separate these cats from the rest of the population. The establishment of an ethics committee can be helpful.

Standard of care for cats after having passed quarantine

Special effort should be made to maximise the chances of rehoming cats as soon as possible. Lengthy periods of time spent in the shelter eventually may be associated with decreased activity levels, decreased eating behaviour and a greater tendency towards agonistic interactions.¹¹ Additionally, a shorter turnover time contributes to a reduction in circulating pathogens.³ Increasing time of residence in the shelter increases the risk of upper respiratory tract disease.¹²

Cats that are not rehomed should receive a regular veterinary check at intervals recommended by their veterinarian. Special attention should be paid to signs of stress, frustration or behavioural changes. Regular deworming and flea treatment (as well as heart worm prevention in endemic areas) and booster vaccinations should be performed.

Testing of
all incoming
cats for
FeLV antigen
and
FIV antibodies
during the
quarantine
period
is essential
in shelters that
allow contact
between cats.



For each cat, a complete record of medical care should be kept.

Testing recommendations

Retrovirus infections

The decision to test all incoming cats for FeLV antigen and FIV antibodies rests with the individual shelter but testing is essential during the quarantine period in shelters that allow contact between cats. Ideally, and especially in areas with high FIV or FeLV prevalence, cats that are negative at the first testing should be retested 6 weeks later and kept in quarantine for the 6-week period to reduce the risk of missing a cat that has just recently become infected, since it may take up to 6 weeks (or even longer) after FIV infection for antibodies to be detectable,¹³ and 4–6 weeks for a cat to become positive for FeLV antigen.¹⁴

If a cat tests positive for FIV, FeLV or both, it should be housed separately until adoption. A positive FeLV antigen test may indicate a transient infection, but as this is rarely detected by FeLV antigen tests and cats may remain provirus positive after a transient infection, retesting of positive cats is not mandatory in shelter situations. If no retesting is performed, such cats should be considered infected. However, it has to be taken into account that false-positive results may occur; therefore, and especially in areas with low FeLV prevalence, retesting of positive cats should ideally be performed.

Healthy cats with either retrovirus infection should be adopted out as soon as possible, but only to indoor-only single-cat households. Prospective owners have to be informed about the existing infection and the consequences (potential recurrent illness, responsibility to avoid virus spread to other cats, shortened life expectancy, which is especially the case for persistently FeLV viraemic cats). The mean survival time is significantly shorter in FeLV viraemic cats compared with FeLV negative ones.¹⁵ Hardy et al, in 1976, reported that 70–90% of FeLV viraemic cats would die within 18 months to 3 years.¹⁶

Kittens up to 6 months of age might still test positive for FIV due to maternally derived antibodies and may not be infected.¹⁷ Therefore, kittens should be kept in quarantine or rehomed and be retested after the age of 6 months.

Both retroviral infections may persist for long periods of time with no obvious clinical signs or non-specific signs. FeLV is shed in high amounts, especially via saliva, and may be transmitted very efficiently. Consequently, testing for FeLV antigen minimises the risk of FeLV introduction into the shelter. FIV is

Vaccination recommendations

Young kittens

After clinical examination for assessing the health status, each healthy cat aged at least 6 weeks should be vaccinated as soon as possible against FPV, FHV-1 and FCV infections. (The rare exception would be in the case of unambiguous documentation of vaccination being provided.) In the face of an outbreak, vaccination starting at 4 weeks may be considered. Modified-live vaccines (MLVs) for FPV should be used because of their rapid onset of immunity.¹⁸ For FCV, inactivated or antigen only vaccines as well as MLVs are available. Especially in shelters with high turnover rates, MLVs are preferred as the protective effect develops more quickly. However, MLVs should be avoided in immunocompromised cats, FIV- or FeLV-positive cats, cats with chronic disease (if vaccination is indicated at all), as well as cats with chronic stomatitis and FCV infection. If FPV, FHV-1 and/or FCV outbreaks occur in the shelter, passive immunisation can be performed using immunoglobulin products, where available.

The vaccination course should be continued (if the cat has not been rehomed in the meantime) at 3–4 weekly intervals until at least 16 weeks of age. However, where disease is seen in this time period, more frequent vaccination (every 2 weeks) should be considered.

Older kittens

For cats older than 16 weeks with an unknown vaccination history a single dose of a FPV MLV and two doses of FHV-1 and FCV vaccine, 2–4 weeks apart, should be administered.

Adult cats

For adult cats entering the shelter the vaccination history should be reviewed and a vaccination schedule implemented based on the general ABCD recommendations: annual boosters for FHV-1¹⁹ and FCV²⁰, and boosters for FPV at intervals of 3 years.²¹ Cats should not be rehomed earlier than 48 h after vaccination in order for any side effects to be detected before joining the new owner.

Sick or pregnant cats

For sick or pregnant cats, any decision about vaccination has to be taken for the individual cat, but vaccination is recommended whenever and as soon as justifiable. Pregnant cats should never receive a live FPV vaccine. Alternatively passive immunisation with FPV antiserum may be considered (or anti-CPV-2 canine globulin).

New owners should be informed about the cat's vaccination history (a vaccination certificate should be provided) and when the next booster will be due.

Healthy cats with FIV or FeLV infection should be adopted out as soon as possible, but only to indoor-only single-cat households.



spread mainly by biting. Therefore, especially in socially unstable groups, which may arise under shelter conditions, the risk of FIV transmission is high. FeLV- or FIV-positive cats should not be housed with negative cats. FIV-infected cats can be housed together, FeLV-infected cats can be housed together, but they should not be mixed. Their immunocompromised status must be considered; they are particularly susceptible to infectious agents and so their health status should be monitored very carefully. In addition, it should be kept in mind that some secondary infections may have zoonotic potential.

Other agents

The ABCD does not recommend testing incoming cats for other infectious agents, including feline coronavirus (FCoV), FCV, FHV-1, FPV and lungworm, unless there are indicative clinical signs. We also do not recommend testing for intestinal parasites but instead suggest that all incoming cats are dewormed.

Hygiene recommendations

Hygiene is the single most important aspect of infectious disease control. Adequate hygiene conditions should ensure that contact between shedders of infectious agents and susceptible animals is reduced as efficiently as possible. New infectious diseases are emerging continuously and are often impossible to foresee. Maintaining high levels of hygiene, and training staff well, will prevent such diseases, when they do emerge, from spreading and becoming catastrophic. A lack of hygienic measures may cause disastrous losses: for example, outbreaks of virulent FCV infection in veterinary surgeries have resulted in closure of those surgeries for days to weeks; this might have been averted if stringent barrier nursing had been observed at all times.

It is essential to provide ongoing training for the staff and to re-evaluate the vaccination strategy and practice routines with infectious disease if the epidemiological situation makes it necessary.

It is important to consider the resistance of infectious agents in the environment. Viruses such as FPV and oocysts of, for example, *Isospora*, can survive in the environment for months to years; indirect transmission is a major challenge in any environment with a high turnover of animals. FCV can survive for

3 days on telephone buttons and receivers and 1–2 days on computer mice.²² Therefore, careful thought needs to go into how disinfection of these items, as well as the consulting room table and hands, can be incorporated into the routine of cleaning between each consultation in the veterinary surgery.

The spread of infectious diseases may be avoided by providing separate accommodation and quarantine, ensuring strict movement control, appropriate hygiene procedures of care workers, barrier nursing, cleaning and disinfection, vaccination and limitation of animal density. In addition, chronic stress should be minimised to keep animals (and people) healthy.

Movement control

Movement control has to be considered between the areas described in order to prevent spread of infectious agents to susceptible animals either through direct contact between cats or indirectly (via humans or equipment). During the quarantine period cats should not be moved to the accommodation for healthy, FeLV- and FIV-negative cats. Cats showing signs of infectious disease (eg, upper respiratory tract disease) or testing positive for FeLV and/or FIV should be transferred to isolation facilities. If cats are housed individually, FIV-positive cats can be kept in the homing area. In the quarantine and isolation areas individual pens should be used. If at all possible interactions between cats should be restricted to healthy cats originating from the same household.

Hygiene procedures of care workers

In order to prevent indirect transmission of infectious agents by persons or fomites, strict protocols are required detailing the appropriate hygiene procedures to be undertaken by care workers. It is essential that care workers are not only trained adequately, but that the shelter also provides a sufficient capacity of care workers. It is not acceptable that the number of animals exceeds the capacity of care.

Care workers should not wear street clothes, but should use clothes that are easily cleanable or disposable (including shoe covers, gloves, etc). In quarantine and isolation areas protective clothing (overalls, aprons, gloves, area-specific footwear or boots) should always be used and changed (preferably disposable) or at least disinfected between cats. Clothing should not be taken outside the respective area. If overshoes are not used, footbaths should be available. However, it has to be considered that poorly maintained footbaths may potentially contribute to the distribution of pathogens. If used, they have to be cleaned and changed at

Hygiene is the single most important aspect of infectious disease control.



least twice daily. Disposable footwear is always a preferable option.

For the healthy cat accommodation, each care worker may use the same apron/overall for one unit.

Each area should be equipped with its own set of food and water bowls, litter trays, bedding, cleaning equipment, rubber gloves, footbaths, overshoes, etc. It is helpful to keep these in different colours to avoid confusion.

Access to quarantine and isolation areas should be restricted rigorously. Ideally, different people should take care of different groups of cats. Otherwise barrier nursing processes should be followed strictly.

A disinfectant hand wash should be used between handling individual cats, before and after breaks, and by all visitors.

All cages and pens should be cleaned daily. Cleaning of one cage/pen/area should be completed before moving to the next one. A deep clean and disinfection (whereby all areas including walls, floors, glass, doors, ceiling, etc, are cleaned and disinfected – see below) should be performed when a cat is rehomed before the cage/pen is used for the next animal.

Barrier nursing

A routine should be established whereby susceptible 'clean' animals should be fed and their litter tray changed first. Older, vaccinated animals should be attended to next, followed by the cats in quarantine and then the sick cats. The person tending the cats should not go back to the susceptible cats after dealing with those that are sick. Each cat should be provided with two sets of litter trays and bowls, so that while one is being cleaned and disinfected, the cat may use the other. Larger shelters will have separate attendants for healthy kittens, adult cats and sick cats. The most hygienic shelters will provide an overall, overshoes, boots or a footbath, and rubber gloves for staff to wear when attending each individual pen.

Cleaning and disinfection

Pens and cages should be thoroughly cleaned with detergent to remove organic matter before disinfection. For disinfection (especially between cats inhabiting pens), an appropriate disinfectant should be used. As non-enveloped viruses such as FPV and FCV are of particular concern in shelters, only disinfectants that are efficacy-tested against these viruses should be used. Common disinfectants known to inactivate non-enveloped viruses are, among others, based on aldehydes, peracetic acid, monopersulfate (potassium peroxymonosulfate) or hypochlorite. As alcohols do not inactivate parvoviruses they should not be used as a sole measure. It is

Table 1 Virus transmission and shedding

Infection	Survival outside host	Virus shedding	Mode of transmission	Prevention of infection
FCV	Up to 1 month ²⁰	Continuous	Direct contact (sneezed droplets) and indirect transmission	Vaccination; excellent hygiene; sneeze barriers
FHV-1	12–18 h	Intermittent, lasts 7–14 days	Direct contact (sneezed droplets)	Vaccination reduces the risk of clinical signs, but not infection; stress reduction is essential
FeLV	Minutes	Continuous	Direct contact essential – especially via saliva, faeces; transplacental and via milk rare	Test all cats before mixing them; vaccination may be considered
FIV	Minutes	Continuous*	Direct contact essential – mainly biting; transplacental rare	Test all cats before mixing them
FCoV/FIP	Up to 7 weeks ²⁴	Can be intermittent	Mainly via faecal–oral route; indirect, through cat litter, shared litter trays, poop scoops; not transplacental	Excellent hygiene, especially faeces
FPV	Up to 1 year	Usually only 24–48 h, but can be up to 6 weeks	Faecal–oral route, indirect, transplacental	Vaccination is highly recommended for all cats; excellent hygiene and disinfection
Rabies	Minutes	Continuous for a few days (just before and during period of clinical signs)	Biting	Vaccination is very effective.

*Virus load is very low during the long asymptomatic phase

important to observe the correct dilution and recommended contact time. Where coccidial infections may occur, premises should be regularly steam cleaned, and disinfectants that are specifically tested against coccidia should be used in addition to the regular disinfectants. Pens should be left empty for as long as possible between occupants.

If footbaths are used at the entrance to or exit of the quarantine area and isolation facilities, they should be cleaned and the disinfectant changed at least twice daily.

On a daily basis, food and water bowls as well as litter trays must be cleaned thoroughly. Whenever needed they should be soaked in disinfectant for the recommended time, rinsed carefully, dried and returned to the same cat(s). Litter trays and dishes must not be cleaned at the same time in the same sink. In pens with runs and cages for healthy cats 'spot cleaning' may be considered as long as the housing is used by the same cat (Figure 3). This process, which is considered to reduce stress,²³ involves performing cleaning

Table 2 Infectious disease transmission and shedding

Infection	Survival outside host	Shedding	Mode of transmission	Prevention of infection
<i>Chlamydomphila felis</i>	Only a few days at room temperature ²⁵	In ocular secretions, usually for about 2 months, but can be much longer	Mainly direct since organism is fragile; but indirect (eg, on hands) is possible since elementary body can survive outside host	Vaccination may be considered
<i>Bordetella bronchiseptica</i>	Up to 24 weeks in water and moist environment	In oropharyngeal and nasal secretions, up to 19 weeks	Mainly direct and indirect from coughed aerosol	Interspecies transmission between cats and dogs is possible. Vaccination may be considered
<i>Toxoplasma gondii</i>	Years in rodents or other intermediate host; oocysts highly resistant in the environment	2 weeks in cats' faeces	Cats are usually infected by ingestion of oocyst-contaminated food and water	Not really an issue in most multicat environments and probably not feasible anyway
Protozoa (<i>Giardia</i> , <i>Isospora</i> , <i>Tritrichomonas</i>)	Oocysts survive months to years in environment	In faeces	Ingestion usually	Regular steam cleaning of environment; check water and food if suspected sources of infection



Figure 3 Cage with separate compartment for the litter tray, suitable for spot cleaning. 'Tierschutzkompetenzzentrum Klagenfurt', Austria, courtesy of Dr Marina Zuzzi-Krebitz and MMag Alexander Zuzzi

measures while the cat remains inside, instead of moving the cat out of its housing unit. Non-tracking cat litter is preferable to litters that track, in order to reduce spread of infectious agents (eg, FPV and FCoV).

Bedding and soft materials are either disposed of or cleaned of organic material, soaked in disinfectant and then washed in a washing machine at as high a temperature as possible. Furniture, toys and scratch-posts should be removed or cleaned and disinfected if possible.

Information about transmission and shedding of viruses is provided in Table 1, and of other infectious pathogens in Table 2.

Stress reduction recommendations

Stress reduction is important for overall health, and in a shelter environment is especially important to minimise, for example, the development of FIP due to FCoV infection²⁶ or the recrudescence of latent FHV-1 infection. Stress results from aversive stimuli, such as noise, odours, uncomfortable temperatures, unfamiliar people, animals and environments, as well as unpredictable handling. Even minor changes, such as moving from one cage to another or being placed in a carrier, can be significantly stressful for cats. Stressful effects of aversive stimuli are amplified when events are unpredictable or the animal lacks the opportunity to modulate their effects through behavioural responses. A feline stress-scoring system has been proposed,²⁷ which may help to monitor the success of interventions.

Housing

Shelter cats housed either at high densities or

in large groups display more signs of stress than cats housed singly. Cats that have not been socialised to other cats also experience more stress in housing. Stable groups are preferred, because the introduction of new animals inevitably creates stress as well as disease control challenges.³ When keeping cats in groups, attention should be paid to social compatibility in order to reduce stress and fighting.

High-sided cardboard boxes or easily disinfectable beds allow timid cats to hide from view. In shelters where both dogs and cats are rescued, cats should be housed in a different section to dogs (not only to avoid direct and indirect contact but also to reduce stress inflicted by barking dogs).

Environmental enrichment, offering possibilities for hiding, playing, climbing, perching and watching outside activities, is important for stress reduction and general wellbeing. However, efforts at introducing enrichment must take each cat's individuality into account. What is relaxing for one cat may be highly stressful for another, depending on past experience, genetics and individual temperament.³

Pheromones

In some shelters, pheromones, which are substances transmitting specific information between animals, are used in an attempt to reduce stress levels in the cats. However, a systematic review by Frank et al of the scientific literature evaluating the use of pheromones found that most of the reports reviewed provided insufficient evidence of their efficacy for the treatment of undesirable behaviour in cats and dogs [EBM grade I].²⁸ Therefore, no firm recommendations can be provided.

Stress results from aversive stimuli, such as noise, odours, uncomfortable temperatures, and unfamiliar people, animals and environments, as well as unpredictable handling.



EBM grades

The ranking system for grading the level of evidence of a statement within this article is described on page 533 of this Special Issue.

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Conflict of interest

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