

GUIDELINE for Infectious diseases in shelter situations and their management

Published: 01/07/2013

Last updated: 13/12/2022

Last reviewed: 05/06/2023

The Prevention of infectious diseases in cat shelters guidelines were published in *J Feline Med Surg* 2013, 15: 546-554 and updated in *J Feline Med Surg* 2015, 17: 578; this update has been authored by [Karin Möstl](#) et al.

Key points

- In shelter situations, infectious diseases are difficult to prevent and control, thus; they spread quickly
- Shelters are unstable biological environments; not only are disease outbreaks frequent, but new pathogens or virulent variants of endemic pathogens can emerge as a result of rapid transmission cycles and the consequent evolution and selection of infectious agents, such as viruses and bacteria. The virulent systemic feline calicivirus infection is a case in point (Pesavento and Murphy, 2014).

Introduction

Definitions

Rescue shelter: where cats are kept temporarily until a new guardian is found or euthanasia is performed. ABCD emphasises that keeping cats in shelters should be avoided whenever possible. Where other arrangements can be made, cats should not enter rescue shelters. This reflects the inevitable stress and risk of infection associated with movement to this type of accommodation. However, where necessary, good practice should be adopted to minimise these side effects.

Boarding catteries: where cats are put temporarily while their guardians are on vacation or business

Multicat pet households: where more than one pet cat is kept

Rescue shelters: where rescued cats are kept until they die

Breeding catteries: where cats are bred intentionally

Trap, neuter and return (TNR) cat colonies: where cats roam freely, with or without permanent carers, and in which TNR is undertaken, usually by charities

This guideline considers only rescue shelters, although the hygiene aspects will also apply to other situations. ABCD recognises that there is a wide variation in the design and management of shelters, which largely reflects local financial constraints. The guidelines have been written with this diverse audience in mind; they point to the ideal situation and suggest compromises that can be made where the ideal cannot be attained. Furthermore, they focus on recommendations regarding prevention and control of infectious diseases.

Focus on the problems

In shelter situations, infectious diseases spread frequently and quickly; they are difficult to prevent for the following reasons (Möstl et al., 2013):

- In many cases, all incoming cats are accepted.
- Cats can be persistently / latently infected with infectious agents.
- Recently accepted cats often reside alongside long-term residents.
- Often a no-kill policy is enforced.
- Stress, poor nutrition etc. facilitate spread of infectious agents and development of disease.
- Shelters are often short of money/funding, resulting in crowding, inadequate hygiene and vaccination, and a lack of testing for infectious diseases.
- Persons who work in shelters are highly motivated but not always sufficiently trained in hygiene and disease management.

A preventive management program should be implemented by the local veterinary surgeon that considers possible routes of infection and minimises the circulation of pathogens. Measures include the regulation of housing conditions, quarantine, good husbandry, testing for infectious diseases, vaccination, good hygiene management and stress reduction.

Housing recommendations / Accommodation

Good building design can aid infectious disease control. Compartmentalisation of the shelter into individual sections can facilitate containment of a disease outbreak, should it occur. In general, four separate areas are required:

1. a quarantine area for incoming cats,
2. isolation facilities for sick or potentially infectious cats,
3. accommodation for healthy, feline immunodeficiency virus (FIV) and feline leukaemia virus (FeLV) negative cats,
4. accommodation for pregnant and lactating queens and their kittens.

Quarantine area for incoming cats

In state-of-the-art shelters, all cats are housed individually or within groups from the same house. Under less-than-ideal conditions, incoming cats should be kept in quarantine for a minimum of 3 weeks (considering cats incubating feline parvo/panleukopenia virus (FPV) or FCV infections or reactivating latent feline herpesvirus (FHV) infections, and until their vaccination becomes effective). Considering the risk of FIV and FeLV infections, where all incoming cats are routinely screened (e.g., in high-risk areas), ideally quarantine should not be shorter than 6 weeks (the period for FIV seroconversion and for becoming FeLV antigenaemic can be 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 e.g., FeLV must be isolated. Isolation areas must be strictly separate from the quarantine area and other residents, preferably in a separate building.

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, FHV and FCV) that have access to an adjacent outdoor area are ideal (Fig. 1). Fencing should 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. To facilitate adoption, potential new owners should be able to view the cats, but windows for viewing should be perspex or glass, not wire mesh.



Fig. 1. Outdoor area adjacent to accommodation for healthy cats ("Tierschutzkompetenzzentrum Klagenfurt", Austria; kindly provided by Dr. Marina Zuzzi-Krebitz and MMag. Alexander Zuzzi)

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, which no other cat should be allowed to share. Ideally, these cats should not be housed in a shelter, but instead they should be kept in foster families/homes that are organised and facilitated by the shelter.

Facilities and equipment

The entrance to each section should have facilities for hand washing and places for clean overalls. Ideally there should be washrooms where carers can wash their hands (Fig. 2). Hand and equipment disinfectants should be easily accessible. Overshoes should be provided, or a boot bath of disinfectant should be placed at the entrance/exit of the quarantine area and isolation facilities. Alternatively, footwear should be regularly disinfected when moving between sections. Equipment for cleaning, disinfecting, feeding etc. must be available for each area and must be kept strictly there. To facilitate identification, different colours for food and water bowls, litter trays, beds etc. specific for each area should be used.



Fig. 2. Washroom at the entrance to units ("Tierschutzkompetenzzentrum Klagenfurt", Austria; kindly provided by Dr. Marina Zuzzi-Krebitz and MMag. Alexander Zuzzi)

Corridors should have non-porous surfaces with easily disinfected, rounded corners. Floors of the indoor facilities and furniture should be easily cleaned (e.g., no carpets).

Each room for cat accommodation must include sufficient litter trays: one tray for each adult cat plus one extra. Litter trays should be placed away from food and water bowls. Also, sufficient food and water bowls, beds, scratching posts, toys and hiding areas should be provided.

The use of cages should be restricted to special circumstances, like medical indications (e.g., during quarantine period, after surgery or injuries, in the isolation facilities); regional legislation about the adequate size of cages must be considered.

In all accommodation, attention must be paid to provide a suitable environmental temperature (10-29 °C), good air quality (10-12 exchanges per hour), prevention of noise and other stressful factors (Hurley, 2005; Geret et al., 2011).

A detailed overview of essential requirements for cat housing is given by Wagner et al. (2018a, 2018b).

Animal density

Animal density in rescue shelters should be kept as low as possible, as the prevalence of pathogenic micro-organisms and consequently infectious disease is correlated with population density and size. In the best shelters, cats are housed individually or only together with cats from the same original household.

Groups should be kept stable, as far as this is achievable with the turnover / adoption of cats by new owners. Kittens should be kept in a special quarantine facility together with only their litter mates, and without contact with adults other than their queens. High animal density not only increases the risk of infectious diseases but may also produce stressful situations. No formula for the recommended number of cats per group can be given, as additional elements such as environmental enrichment and the quality of care can have a

great influence.

With respect to the management of infectious diseases, groups should be kept as small as possible. Coronavirus infections for example occur at significantly higher rates in multicat situations compared to single cat households. In catteries and shelters with more than 6 cats, this infection is virtually always present (Pedersen, 2009). ABCD recommends keeping groups of 3 or less cats per room ([ABCD Guidelines on Feline Infectious Peritonitis](#)), otherwise the risk of cross infection increases dramatically.

Standard of care in the management and prevention of infectious diseases

Various pathogens affecting felines are ubiquitous and frequently introduced into shelters. In a rescue shelter in Belgium, Zicola et al. (2009) found prevalence rates for FHV and feline calicivirus (FCV) of 20.1 and 33.1 %, respectively. In the UK, the FCV prevalence is approximately 30 % in shelters (Radford et al., 2001; Coyne et al., 2007). Pathogens can be shed intermittently or continuously over prolonged periods of time (sometimes subclinically). In the shelter environment, rapid and efficient spread may occur as soon as the first week after introduction of incoming cats (Pedersen et al., 2004).

Careful observation and examination of the health status of cats in a shelter, especially of new arrivals, and testing procedures are essential to detect infectious (and other) diseases at an early stage. A particular focus on disease signs and diagnosis is required when new or emerging infectious diseases are circulating, such as SARS-Coronavirus-2 (SARS-CoV-2) which emerged in 2019 and caused Coronavirus Disease (COVID)-19. The host spectrum of this virus is wide, with cats and ferrets being highly susceptible to infection ([ABCD Guidelines on SARS-Coronavirus \(CoV\)-2 and cats](#)).

Care workers should be instructed about the risk of zoonotic infections, about signs which could point to a zoonotic risk and how to handle potentially infected cats (e.g., in areas endemic for rabies, stray cats should always be approached with caution).

Standard of care for incoming cats

Each incoming cat should receive a full health check by a veterinarian.

Cats should be specifically checked for gastrointestinal, respiratory, and dermatological problems, as these are commonly contagious and should be diagnosed and treated immediately. Dermatophytosis is the most common contagious and infectious skin disease of cats and very difficult to eradicate in catteries and shelters ([ABCD guidelines on Dermatophytosis](#)).

Incoming cats should be dewormed and treated for external parasites. In areas endemic for heartworm, cats aged more than 2 months should be placed on a prevention regime ([ABCD guidelines on Dirofilarioses in cats](#)). Testing is strongly recommended and is based on both antigen (cats older than 5 months) and antibody (cats older than 2 months) detection. However, where a “do not test policy” applies in shelters with limited financial resources, chemoprophylaxis can be safely administered.

Every cat in a shelter should be neutered.

Details of all medical interventions should be recorded and stored.

Arrival in a shelter is always stressful; stress should be minimised to avoid exacerbation (e.g., of coronavirus infection leading to feline infectious peritonitis [FIP]) or reactivation of infection (e.g., of latent FHV).

Cats should not be euthanised, unless they are in a moribund, terminal condition. If appropriate treatment is unavailable and cats are suffering, euthanasia should be considered for humane reasons.

ABCD does not recommend the euthanasia of healthy FIV or FeLV infected cats, unless they cannot be kept separate from the rest of the population. Ideally a separate colony should be set up for FIV positive cats, but the importance of social compatibility has to be considered to minimise the risk of fighting and biting to reduce the risk of virus transmission.

Standard of care for cats following the quarantine

Active efforts should be made to improve the chances of re-homing shelter cats as quickly as possible. Gouveia et al. (2011) showed that lengthy periods spent in a shelter may be associated eventually with decreased activity levels, decreased food uptake and a greater tendency towards antagonistic behaviour. Additionally, a shorter turnover time contributes to a reduction in circulating pathogens (Hurley, 2005).

Cats that are not re-homed should receive regular health checks 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 heartworm prevention in endemic areas) should be performed.

Revaccinations should be performed, and a complete record of the medical history should be kept.

Considerations of euthanasia have been mentioned; a long-term stay in a shelter may have implications on quality of life. The establishment of an Ethics Committee can be helpful.

Testing recommendations for incoming cats

Testing for retrovirus infections

The decision to test all incoming cats for FeLV and FIV infections rests with the individual shelter and depends on the epidemiological situation, as e.g., for the FeLV prevalence in cats in Europe marked geographical differences exist (Studer et al., 2019). In shelters where contact between cats after the quarantine period cannot be prevented, all incoming cats should be tested for FeLV antigen, and ideally also for proviral DNA by PCR, to identify regressively infected cats. Especially in areas with high retrovirus prevalence, cats that are FeLV antigen-negative and/or FIV antibody-negative at first testing should be retested six weeks later, whilst remaining in quarantine. This time period is necessary to reduce the risk of missing a recently infected cat, since it may take up to six weeks (or even longer) after FIV infection for antibodies to become detectable (Sellon and Hartmann, 2006), and 4 to 6 weeks to test positive for FeLV antigen (Hartmann, 2006; ABCD guidelines on Feline Leukaemia Virus Infection). Reverse transcriptase (RT)-PCR detecting FeLV RNA is highly sensitive, testing positive as early as one week after exposure. The AAFP (2020) considers retrovirus testing to be optional if cats are individually housed, but essential when cats are group-housed before entering the group and before being brought to new homes where resident cats are present.

A positive FeLV antigen test indicates that the cat is FeLV-infected and is shedding virus with great probability. However, false-positive results may occur, and immediate retesting of positive antigen tests by PCR for proviral DNA should be performed, especially in areas with low FeLV prevalence. In addition, a positive FeLV antigen test may result from either a progressive (persistent viraemia) or a regressive infection (transient viraemia). Cats with regressive infection are considered protected against FeLV infection once they overcome the initial viraemia; they do not shed FeLV but remain provirus-positive with some risk of reactivation. To differentiate these two outcomes, retesting later is recommended (for details see the "[ABCD FeLV diagnostic tool](#)"). If cats with a positive FeLV antigen test cannot be quarantined until retesting, these animals should be considered infected and as shedders.

Kittens up to 6 months of age might still test positive for FIV antibodies due to the detection of maternally derived antibodies by testing if born to an FIV-infected queen, although they are probably not infected (Levy et al., 2003). Therefore, antibody positive kittens should be kept in quarantine or rehomed and retested at 6 months of age. As an alternative to testing at 6 months, FIV proviral PCR can be performed sooner as the presence of provirus would confirm FIV infection of the kitten. Ideally, the queen as well as the kitten(s) should also be tested by PCR to establish that the diagnostic PCR assay being used detects the FIV subtype present, as the sensitivity of FIV PCR varies (see also the [ABCD FIV diagnostic tool](#)).

Both retroviral infections can persist for long periods of time without causing clinical signs. FeLV is shed in large amounts, especially via the saliva, and can be efficiently transmitted. Testing and preventive measures minimise the risk of FeLV introduction into the shelter. While friendly social interactions suffice for FeLV transmission, FIV is spread mainly by biting. Especially in socially unstable groups under shelter conditions, the risk of FIV and FeLV transmission is high. FeLV-positive or FIV-positive cats should not be housed together with retrovirus-negative cats. FIV infected cats can be housed together, and FeLV infected cats can be housed together, but they should not be mixed. Their immunocompromised status must be considered: they are particularly susceptible to infections, and their health status must be monitored with good preventative healthcare. It should be kept in mind that some secondary infections have zoonotic potential.

Healthy cats with either FeLV or FIV infection should be adopted out as soon as possible, but only to indoor-only, single-cat households. Prospective owners must be informed about the existing infection and the possible consequences (potential recurrent illness, maybe a shortened life expectancy, responsibility to avoid virus spread to other cats).

Testing for other infectious agents

The ABCD does not recommend testing incoming cats for other infectious agents, including feline coronavirus infection (FCoV), FCV, FHV, FPV, lung worms, unless there are specific clinical signs. Although endectocide treatment of all incoming cats is required, testing for protozoal intestinal parasites could be included (ABCD GLs on Giardiasis; ESCCAP, 2018). Where a feline dermatophytosis outbreak is suspected, a shelter-specific outbreak management plan is needed. Detailed information is described by Newbury and Moriello (2014).

Vaccination recommendations (see the [ABCD Tool "Vaccine recommendations for cats"](#))

After clinical examination, each healthy cat aged 6 weeks or older (with rare exceptions, e.g., if unambiguous documentation of vaccination is provided) should be immediately vaccinated against FPV, FHV and FCV infections. In the face of an outbreak, vaccination starting at 4 weeks of age may be considered. Modified live vaccines (MLV) for parvovirus should be used because of their rapid onset of immunity (Greene and Addie, 2006). For FCV, inactivated and MLV products are available; because of the high turnover rates in shelters, MLV are preferred, as protection develops more quickly. However, in some situations of immunocompromisation, for example

in FIV-infected cats or during high-dose or long-term glucocorticoid therapy, MLV should be avoided ([ABCD Guidelines on Vaccination of immunocompromised cats](#)).

If FPV, FHV and FCV outbreaks occur in a shelter, passive immunisation can be performed using immunoglobulin products, where available.

The vaccination course should be continued (if the cat has not been re-homed in the meantime) at 3-4 weekly intervals until the age of 16 weeks. When disease occurs during this time period in the shelter, more frequent vaccination (every 2 weeks) should be considered. For cats older than 16 weeks, a single dose of a FPV MLV and two doses of FHV and FCV vaccine should be administered, 2-4 weeks apart.

Adult cats with a complete vaccination history (including the vaccination 6-12 months after the kitten vaccination course) should be revaccinated annually against FHV (Thiry et al., 2009), FCV (Radford et al., 2009) and against FPV at intervals of three years, unless special conditions indicate otherwise (Truyen et al., 2009).

Cats should not be rehomed earlier than 48 hours after vaccination to allow any side effects to be detected before joining the new owner.

For sick or pregnant cats, the decision must be taken on an individual basis, but vaccination is recommended whenever justifiable and as soon as possible. Pregnant cats should never receive a live FPV vaccine. Passive immunisation with FPV antiserum (or anti-CPV-2 canine globulin) may be considered in these cases, where available.

New owners should be informed about the pet's vaccination history and when the next booster will be due. A vaccination certificate should be provided.

Hygiene recommendations

Hygiene is the most important aspect of infectious disease prevention. The measures should ensure that contact between shedders of infectious agents and susceptible animals is avoided as far as possible. New infectious agents and diseases are emerging continuously and are impossible to predict. Maintaining high levels of hygiene, and having them enforced by well-trained staff, will prevent such diseases from spreading and becoming catastrophic. Lack of hygienic measures may have disastrous consequences; to give an example: outbreaks of virulent FCV in veterinary surgeries resulted in their closure for days to weeks.

It is essential to continuously train and coach the staff, to re-evaluate the vaccination strategy and to enforce the practice routines with infectious disease. As an example, the resistance of infectious agents in the environment must be considered. Parvovirus and oocysts of *Isospora*, for example, can survive in the environment for months to years. FCV survives in the environment and remains infectious for up to one month on dry surfaces at room temperature, and even longer under colder conditions (Doultree et al., 1999; Duizer et al., 2004). Clay et al. (2006) have shown that FCV can survive for several days on telephone buttons, receivers, and computer mice. Therefore, careful planning is required for the decontamination of such objects, as well as disinfecting hands, the consulting room table and the routine cleaning between consultations in the veterinary surgery. Additionally, aerosol spread of the virus has been detected in facilities with FCV-shedding cats (Spiri et al., 2019). Indirect transmission is a major risk in any environment with a high turnover of animals.

The spread of infections and disease can be controlled by separate accommodations and quarantine, movement control, hygiene procedures of care workers, barrier nursing, disinfection, vaccination, and reduction of animal density, as detailed below. In addition, chronic or recurrent stress should be minimised to keep animals (and people) healthy.

Movement control

Movement control must be considered between the areas described above, in order to prevent the spread of infectious agents to susceptible animals through direct contact or indirectly, via persons or equipment.

During the quarantine period cats should not be moved to the accommodations for healthy, FeLV and FIV negative cats. Cats showing signs of infectious disease, such as upper respiratory tract signs, or testing positive for FeLV or/and FIV should be transferred to isolation facilities.

In the quarantine and isolation areas, individual pens should be used.

If possible, interactions should only be allowed between cats originating from the same household.

Hygiene procedures for care workers

To prevent indirect transmission through persons or fomites, protocols are required that detail the hygiene procedures to be followed by

care workers.

Care workers should not wear street clothes in the facility. Professional clothing should be easily cleaned or disposable (including shoe covers, gloves etc.). In the quarantine and isolation areas, protective clothing (overalls, aprons, gloves, footwear or boots) should always be used and changed (preferably disposable) or at least disinfected between cats. Clothing should never be taken outside the respective area. If overshoes are not used, footbaths should be available. However, poorly maintained footbaths can contribute to the distribution of pathogens – they must be cleaned and changed at intervals to ensure that the disinfectant is always working. The manufacturer's instructions should be followed. Disposable footwear is always preferable.

For the healthy cat accommodation, care workers can 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 have these in different colours to avoid confusion.

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

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 should be performed when a cat is homed before the cage / pen is used for the next animal.

Barrier nursing

A routine should be established whereby susceptible 'clean' animals should be fed first and their litter trays changed first. Older, vaccinated animals should be attended to next, followed by the cats in quarantine, and finally the sick cats. The person tending the cats should not go back to the susceptible cats after dealing with those who 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 separate overalls, overshoes, boots or a foot bath, 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 efficacy-tested disinfectant should be used. As in shelters non-enveloped viruses such as FPV and FCV are of particular concern, 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, monopersulphate (potassium peroxymonosulphate), or hypochlorite. As alcohols and quaternary ammonium compounds do not inactivate parvoviruses they should not be used as a sole measure. It is important to observe the correct dilution and recommended contact time. Where coccidial infections can occur, premises should be regularly steam cleaned, and disinfectants 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 foot baths are used at the entrance to or exit of the quarantine area and isolation facilities, the disinfectant used in the foot bath should be efficacy-tested against the relevant pathogens, including parvovirus.

Food and water bowls as well as litter trays must be cleaned thoroughly on a daily basis. 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" can be considered, as long as the housing is used by the same cat (Fig. 3). "Spot cleaning" means that cleaning measures are performed while the cat remains in the cage instead of moving it. Non-tracking cat litter is preferable, to reduce the spread of, e.g., FPV and FCoV.



Fig. 3. Cage with separate compartment for litter tray, suitable for on spot cleaning (“Tierschutzkompetenzzentrum Klagenfurt”, Austria; kindly provided by Dr. Marina Zuzzi-Krebitz and MMag. Alexander Zuzzi)

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, of other infectious diseases in Table 2.

Table 1 - Virus transmission and shedding

INFECTION	SURVIVAL TIME OUTSIDE HOST	VIRUS SHEDDING	MODE OF TRANSMISSION	PREVENTION OF INFECTION
FCV	up to 1 month (Radford et al., 2009)	continuous	direct contact (sneezed droplets) and indirect transmission	vaccination; excellent hygiene; sneeze barriers
FHV	12 - 18 hours	intermittent, lasts 7-14 days	direct contact, sneezed droplets	Vaccination reduces the risk of clinical signs, but not infection; stress reduction essential

INFECTION	SURVIVAL TIME OUTSIDE HOST	VIRUS SHEDDING	MODE OF TRANSMISSION	PREVENTION OF INFECTION
FelV	hours to days	continuous	direct contact essential - especially via saliva, faeces; bites, transplacental, 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	days to a few weeks (Scott, 1988)	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 hours, 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		

Table 2 - Transmission and shedding of nonviral infectious agents

INFECTION	SURVIVAL TIME OUTSIDE HOST	SHEDDING	MODE OF TRANSMISSION	PREVENTION OF INFECTION
<i>Chlamydia felis</i>	only a few days at room temperature (Greene and Sykes, 2006)	in ocular secretions, usually for about 2 months, but can be much longer	mainly direct since organism is fragile; but indirect (e.g. on hands) is possible since elementary body can survive outside host	Vaccination can be considered.
<i>B. 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 an issue in most multicat environments and prevention unlikely to be feasible

INFECTION	SURVIVAL TIME OUTSIDE HOST	SHEDDING	MODE OF TRANSMISSION	PREVENTION OF INFECTION
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

Stress reduction recommendations

Stress reduction is important for overall health, especially in a shelter environment, to decrease the risk of development of FIP from a FCoV infection (Rohrer et al., 1993) or to avoid reactivation of latent FHV.

Stress results from various unpleasant stimuli, such as noise, odours, uncomfortable temperatures, unfamiliar people, animals and environments, as well as unskilled handling. Even minor changes, such as moving from one cage to another or being placed in a carrier, can be stressful for cats. Stressful events are amplified when unpredictable, or when the animal lacks the opportunity to modulate their effects through behavioural responses (Carlstead et al., 1993; Hurley, 2005). A feline stress-scoring system has been proposed (Beata et al., 2007), which may help to monitor the success of interventions. Arhant et al. (2015) investigated animal-based parameters for cat welfare, which are stable over time and reproducible by different assessors. They a correlation between very thin cats correlated and pens with less than one lying area per cat and with fewer hiding places for all cats. Poor coat condition was associated with the length of time spent in the shelter.

Stress is effectively reduced by maintaining low animal densities. In animal shelters, cats housed at high densities or in large groups display more signs of stress than singly housed cats. If the cats have not been socialised with other cats, they also experience more housing stress. Stable groups are the best option, because the arrival and departure of new animals inevitably creates stress, as well as disease control challenges (Hurley, 2005). When keeping cats in groups, attention should be paid to social compatibility.

Environmental needs

The AAFP and ISFM published guidelines on Feline Environmental Needs (Ellis et al., 2013) and an AAFP Statement describes general principles of feline well-being (AAFP, 2021). The “five pillars” concept describes the essential requirements for the cats’ environment that are necessary for the overall well-being of cats; these are a safe place, multiple and separated key environmental resources like food, water, toileting areas etc., the opportunity for play and predatory behaviour, positive, consistent and predictable human-cat social interaction and an environment that respects the importance of cats’ sense of smell (Ellis et al., 2013).

Providing environmental needs like beddings, scratch posts, toys and hiding areas plays an important role for stress reduction. High-sided cardboard boxes or easily disinfectable beds allow timid cats to hide away from view (Rochlitz, 1999; Ellis, 2009). Newly sheltered cats provided with a hiding box during quarantine had significantly lower stress levels compared to cats without this enrichment (Vinke et al., 2014). Animal handling, such as stroking anxious cats, can have positive effects, as suggested by an increase of S-IgA and reduction of upper respiratory tract disease (Gourkow et al., 2014). In facilities where both dogs and cats are kept, cats should be housed separately (not only to avoid contact, but also to reduce stress from exposure to dogs’ smell or barking).

Offering possibilities for hiding, playing and watching outside activities is important for stress reduction and general well-being (Fig. 4). However, efforts at environmental enrichment must take a cat’s individuality into account. What is relaxing to one cat could be stressful to another, depending on prior experience, genetics, and individual temperament (Hurley, 2005).

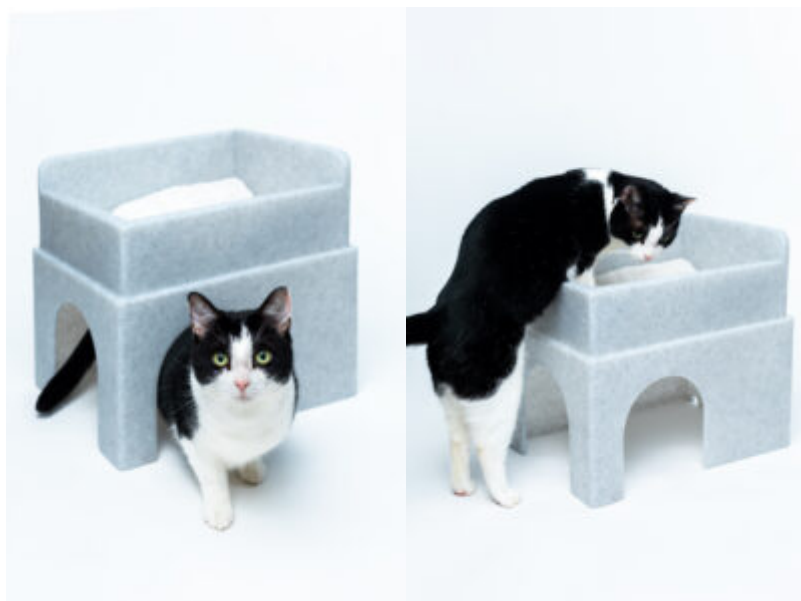


Fig 4: Hide & Sleep[®], Cats Protection (<https://www.cats.org.uk/help-and-advice/information-for-vets/feline-fort>)

Pheromones

In cats, olfactory and chemical information plays an important role to evaluate the environment and for social communication. Naturally occurring pheromones are chemical messengers that are excreted on the outside of the cat's body. They have various functions, like sexual communication, to mark individuals, objects and spaces, to promote mother-kitten bonding or trigger a social response in members of the same species. A detailed description of the types of naturally occurring pheromones is available from Vitale (2018).

Some of the feline pheromones are available as synthetic analogues, as collars, spray, wipes and diffusers. Synthetic F3 feline facial pheromone is proposed to decrease behaviours related to stress (Vitale, 2018). It has been claimed that their application to a cat's living space may provide environmental enrichment (Pageat and Gaultier, 2003). Some studies provide empirical evidence for effectiveness. For example, Contreras et al. (2018) performed a randomized, double-blind, placebo-controlled study on FHV infected kittens and found that sneezing occurred more frequently in the placebo group and sleep more frequently in the pheromone-treated group. However, the number of animals was low (6 per group), and FHV-DNA was detected rarely so that no comparison between groups could be performed to test the statistical significance of the findings. Pereira et al. (2016) investigated in a randomised, double-blind, placebo-controlled clinical trial the usefulness of an F3 spray during veterinary consultation. The stress level assessed by an observer was lower in the pheromone group compared to a placebo group, but there was no difference in the ease of handling. F3 facial pheromone is considered as a treatment against house-soiling (Carney et al., 2014). Horwitz and Pike (2014) have published anecdotal observations that synthetic pheromones are useful when introducing new cats into a household. A product containing the F3 analogue and catnip was shown to reduce stress levels during potentially stressful events like blood pressure measurement, but the effect was not long-lasting (Bernachon et al., 2015).

Synthetic pheromones have been used in shelters with the objective to reduce stress. Silva et al. (2017) described that treatment of cats with an F3 analogue in a shelter environment led to a decrease of salivary cortisol levels in the majority of cats, but no control group was included in the study. However, Chadwin et al. (2017) evaluated a synthetic feline facial pheromone product on stress scores and the incidence of upper respiratory tract infection in 336 shelter cats of two animal shelters and did not find evidence that the evaluated product had any effect on these parameters.

The results published in the literature are not compelling, because the experimental design is often deficient, e.g., the lack of control groups (Zhang et al., 2022). Therefore, Zhang et al. (2022) concluded that the evidence that there is a reproducible effect of therapy of cat chemical signals for stress is weak. Previously, a systematic review conducted by Frank et al. (2010) found insufficient evidence for the effectiveness of pheromones in the treatment of undesirable behaviour in cats and dogs.

Wells (2009) concluded that sensory stimulation harbours enrichment potential, but any benefit depends on various factors, and it has to be considered that stimulating odours may even cause increased agitation leading to the development of active types of problematic behaviours. Vitale (2018) considered the use of synthetic pheromones as a valid field of research and recommended to consider cat individuality, employing pheromones on a case-by-case basis and using them alongside other interventions. Also, Zhang et al. (2022) concluded that more research is required into the biological functions of olfactory stimuli, as well as improved study designs and measuring techniques. In summary, more detailed research is required before drawing firm conclusions about the benefit of applying

pheromones to increase cat welfare.

Further information

When planning to build a rescue shelter, it is recommended to consult an authority like [International Cat Care](#) or the [UC Davis Koret Shelter Medicine Program](#). Advice on sneeze barriers, pen construction and dimensions to minimise disease spread can be obtained from dedicated specialists. Much useful information is available in textbooks such as the “BSAVA Manual of Canine and Feline Shelter Medicine Principles of Health and Welfare in a Multi-animal Environment” (<https://www.bsavalibrary.com/content/book/10.22233/9781910443330>). It is also helpful to visit several rescue shelters and animal hospitals to observe what is available and to view the different options in practice.

Acknowledgement

ABCD Europe gratefully acknowledges the support of Boehringer Ingelheim (the founding sponsor of the ABCD), Virbac, IDEXX and MSD Animal Health.

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