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The Association of Shelter Veterinarians' Guidelines for Humane Rabbit Housing in Animal Shelters

Authors

Erica Schumacher*
Shelter Medicine Program, Department of Medical Sciences, School of Veterinary Medicine, University of Wisconsin-Madison, Madison, WI, USA

Elizabeth Berliner*
Shelter Medicine Services, American Society for the Prevention of Cruelty to Animals, New York, NY, USA

Sarah Hicks*
Shelter Medicine Program, Department of Medical Sciences, School of Veterinary Medicine, University of Wisconsin-Madison, Madison, WI, USA

Chumkee Aziz
Koret Shelter Medicine Program, School of Veterinary Medicine, University of California-Davis, Davis, CA, USA

Emilia Wong Gordon
Haven Veterinary Services, Vancouver, BC, Canada

Zarah Hedge
San Diego Humane Society, San Diego, CA, USA

Kate Hurley
Koret Shelter Medicine Program, School of Veterinary Medicine, University of California-Davis, Davis, CA, USA

Jessica Reed
Cornell University College of Veterinary Medicine, Maddie's® Shelter Medicine Program, Ithaca, NY, USA

Rebecca Stuntebeck
Koret Shelter Medicine Program, School of Veterinary Medicine, University of California-Davis, Davis, CA, USA

*Editors

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Introduction

Purpose

The purpose of this document is to provide guidelines for the humane housing of rabbits in animal shelters, rescue groups, and foster homes, based on expert input and available scientific research. The authors hope this document will serve as a robust beginning to an ongoing and lively dialogue on how shelters can improve the well-being of rabbits in their care.

About this document

This project began as a discussion of shelter medicine experts exploring the needs of rabbits in animal shelters and recognizing the lack of resources specific to this unique species. In particular, a pervasive lack of species-appropriate housing was identified, hindering many shelters' ability to meet rabbits' essential welfare needs. As a result, the decision was made to focus this document on rabbit housing, with shelter policy (such as intake and adoption), husbandry and care issues presented only as they relate to housing considerations. The authors of this document are shelter medicine veterinarians with broad expertise in the operational and care aspects of supporting animal well-being in animal shelters.

The authors performed a comprehensive literature review on topics related to housing of rabbits in shelters and other confinement settings. Section leads crafted recommendations, which were then reviewed and revised by group consensus. Whenever possible, recommendations are supported by published references on rabbit housing and behavior. Applications of animal welfare principles and practices include inferences from what is known about the activities, preferences and behaviors of rabbits in natural environments.

A draft of this document was then circulated to subject matter experts with deep knowledge of rabbit care in shelters and other settings, as well as experts in principles of shelter facility design. We are grateful for their review and recommendations, and they are recognized in the acknowledgments.

While this document is published by the Association of Shelter Veterinarians (ASV), it does not adopt the formal framework established in the ASV Guidelines for Standards of Care in Animal Shelters regarding the terms Ideal, Must, Should, and Unacceptable. In this document, these terms are used in their conventional, broadly understood sense, rather than according to the specific definitions outlined in the ASV Guidelines. The language choices reflect what was most appropriate for the context of each recommendation and were intended to support clarity and ease of understanding.

The challenges of humanely housing rabbits in shelters

Quality housing is fundamental to the health and well-being of confined animals. In a shelter, the stakes are particularly high. Many animals are already stressed by an abrupt change in environment and the loss of familiar physical and social markers. Whether they've been accustomed to an indoor home in close contact with people and other pets, or an outdoor life with a looser network of human and animal connections, confinement in a shelter represents profound change. Disease risk is often elevated as animals from various backgrounds are intermingled and limited staffing accentuates the importance of housing that facilitates easy and efficient cleaning and care. Even the likelihood of adoption is influenced by the environment in which the animal is seen.[1]

The housing model presented in shelters also has the potential to exert an influence in the surrounding community. Visitors may assume cramped or barren housing is a reasonable standard when they see it accepted in an animal welfare organization, whereas enriched, species-appropriate environments can serve as a model for care. Thus, the consequences of getting shelter housing right can be profound for animals and people alike, while poor housing can be costly and stressful at best, and deadly at worst.

In this context, it is helpful to provide a framework for evaluation of housing. Adequate housing must provide at minimum the Five Freedoms of Animal Welfare, ensuring that animals have the opportunity to eat and drink normally; are protected from pain, disease and injury; are not unduly subject to fear or distress; and are comfortable and able to express normal species-specific behaviors. The Five Domains expand on the Five Freedoms to define the positive mental states supported by an enriched environment, versus merely minimizing negative impacts (Fig. 1 and Table 1).[2] In a shelter, housing must also fulfill functions related to the mission of the organization, such as presenting animals in an appealing and accessible way to adopters, or safe-keeping of animals confiscated as part of a legal investigation or whose owners are temporarily unable to provide care.

Rabbits pose a particular challenge when it comes to humane housing. Domestication of rabbits from their European forebearers is a relatively recent event, and selection for breeding has historically been more focused on fur and meat production than for tameness or enjoyment of handling. Indoor and confinement housing is also

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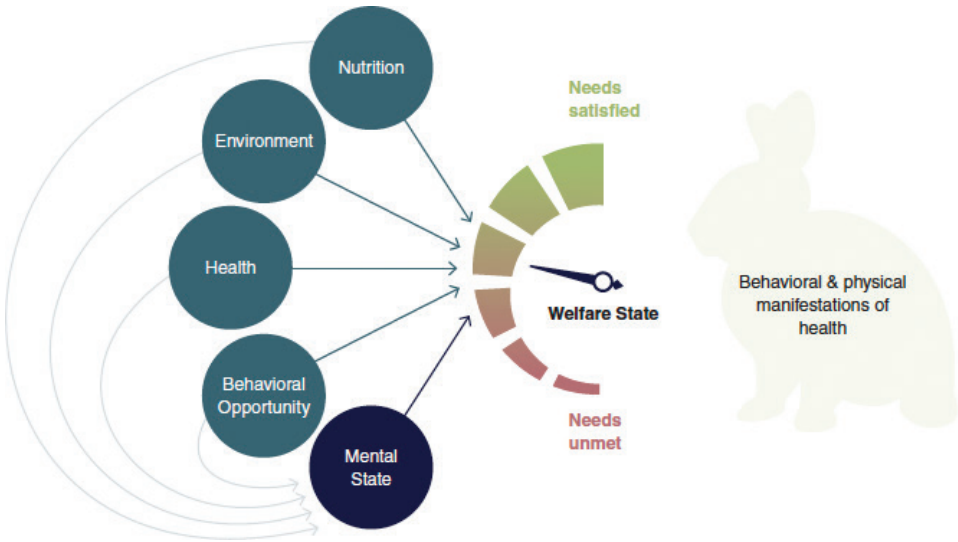

Fig. 1. The five domains of animal welfare in action.

Table 1. The Five Domains that contribute to an animal's welfare status[3]

	1. Nutrition	2. Environment	3. Health	4. Opportunity	5. Mental state
Positive experiences	Enough food and water Fresh clean water Balanced, variety of food	Comfortable Temperate Routine Clean Interest/variety	Physical health Good function Good body condition Restful sleep	Choice of environment Choice of interaction Behavioral variety (play, hunt, forage, engage, rest) Novelty	Satisfied Engaged Comfortable Affectionate Playful Confident Calm Encouraged
Negative experiences	Restricted water Restricted food Poor quality Monotonous	Too cold or hot Too dark or bright Too loud or quiet Unpredictable Malodorous Soiled Monotonous Uncomfortable	Body dysfunction or impairment Disease Pain Poor fitness	Barren cage Confined space Separation from people or species Restraint Unavoidable sensory inputs	Fearful or anxious Frustrated Bored, lonely Exhausted Ill, painful Uncomfortable Hungry, thirsty

Adapted from Mellor[2]

relatively new for this species: as recently as a few 100 years ago, most domestic rabbits were raised in outdoor warrens. In the UK, rabbits were even intentionally introduced into parklands as 'Parkys'.[4] Given this history, the behavioral needs of rabbits are more similar to their wild counterparts than is the case for other common pet species seen in shelters.

The European wild rabbits (*Oryctolagus cuniculus*) from which domestic rabbits are descended prefer grassland with soil to dig for burrows and vegetation for cover and hiding. They live in social groups and spend most of their resting time in close contact with each other. Rabbits are most active at dawn, dusk, and nighttime, and spend from 30 to 70% of their time foraging.[5] Running, hopping, exploring, stretching, grooming, nesting, chewing, looking out over the environment and hiding are also common and important behaviors. The home range of wild rabbits varies depending on the habitat quality and available resources but can be up to 50 acres (20 hectares).[6]

With adequate space, domestic rabbits display a range of behaviors similar to their wild counterparts. For instance, group-housed rabbits kept in ~17 ft^2 (1.6 m^2) enclosures exhibited more behaviors comparable with that of wild rabbits, whereas group-housed rabbits kept in ~4.3 ft^2 (0.4 m^2) enclosures performed a more limited range of behaviors.[7]

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The size and environmental complexity required to support the full range of normal rabbit behaviors can be challenging to replicate. Studies have found that even in pet homes the majority of cage housing used fails to meet rabbits' welfare needs.[8,9] In shelters the difficulty is exacerbated by space constraints and practical limitations on co-housing to meet rabbits' social needs. Many shelters were built before rabbits were commonly admitted and consequently rabbits are often housed in cages designed for other species (and sometimes inadequate even for those). As a prey animal, exposure to the sights, sounds and smells of predator species adds to the stress imposed by poor housing for rabbits. As length of stay (LOS) increases, so does the importance of adequately spacious and complex housing,[3] yet unfortunately rabbits stay longer in many shelters than other species.[10]

Given the challenges inherent in providing humane housing in shelters, rabbits are often better served by housing outside of the shelter whenever possible. Shelters should prioritize developing positive alternatives to admission, such as supporting owners to self-rehome rabbits, investing in foster homes for rabbits, partnering with rescue groups or boarding establishments equipped to meet the unique needs of this species, and supporting community rabbits through spay/neuter and return where they are thriving in the environment.

However, there will be times when rabbits must be admitted despite best efforts. In those cases, attention to the overall environmental conditions, location in care, size and setup of the primary enclosure and enrichment spaces, and strategies to safely meet the social needs of rabbits will all help rabbits stay happy and healthy. The number of housing units should also be considered and should be in proportion to the number of positive outcomes expected in relation to the desired LOS. With attention to these details, shelters can better meet the needs of this sensitive species and serve as a model for humane housing and good care that will extend beyond the shelter's walls.

Capacity planning and number of housing units

The number of animals housed at any one time has profound implications for health, welfare, costs, staffing needs, LOS and outcomes.[11–13] For a given space and staffing level, fewer housing units means each one can be larger, with more time for care of each animal. More space and attention in turn means animals can be better understood, cared for and marketed as individuals, facilitating quick movement to the most positive possible outcome. This triggers a virtuous cycle in which shorter LOS decreases the population in care, lowering disease risks and behavioral deterioration associated with prolonged confinement, further contributing to a decreased LOS.

The number of animals housed also has a direct impact on the average LOS for each. For a shelter performing 10 rabbit adoptions a month, with 10 rabbits in care at any one time, each rabbit will stay for an average of 1 month. If the rabbit population is increased to 20, but the monthly number of adoptions remains at 10, the average LOS to adoption will inevitably increase to 2 months. Doubling the length of time in confinement increases the need for enrichment and care to maintain even basic well-being for individual rabbits, while simultaneously doubling the population and the overall workload for staff and cost of care.

Paradoxically, housing a greater number of animals not only fails to increase adoptions, it may reduce adoptions if the number of choices becomes overwhelming.[14] Moreover, increasing the number of animals housed fails to resolve imbalances between intake and appropriate outcomes. Eventually, a steady state must be reached at which the number entering and leaving the shelter are equal. If that steady state is reached at 20 rather than 10, the effect will be to double the LOS – with the associated costs and risks – without increasing the number of animals served over time.[11,12]

In order to ensure the optimal LOS while serving the most possible animals, therefore, the number of housing units should be thoughtfully planned to avoid overloading the pathway to adoption or the shelter's capacity for humane housing and care. The difficulty of meeting rabbits' welfare needs in shelter confinement adds to the urgency of getting this number right. If the goal is to house rabbits for less than a month each, for instance, no more than the average expected monthly number of adoptions can be housed at one time.

For shelters dealing with larger groups of rabbits sporadically (e.g. in response to hoarding cases), some flux should be anticipated. This demand means not every housing unit can be filled during times of typical intake levels. Additionally, sufficient housing must be available to meet all medical and other needs in preparation for adoption. For some shelters, it may be possible to develop 'back of house' or even off-site housing that provides more flexible and spacious options for rabbits not currently candidates for adoption.

Many shelters currently house far more than a month's worth of rabbits for adoption, resulting in predictably prolonged LOS. There are over 30 times as many pet dogs and cats as pet rabbits.[15,16] Housing numbers should be similarly proportionate and reflect adoption metrics and average LOS.[15,16]

For a one-time population reset, concerted marketing and promotions can be combined with a short-term moratorium on non-emergency intake until the number of rabbits housed aligns with the organization's capacity for housing, care, and adoption. This process can be

repeated when the population balloons beyond optimal levels (e.g. due to a large influx). Support for foster-finder and self-rehoming during these efforts can help shape more positive alternatives to shelter entry. Every shift toward a lower number of rabbits housed in increasingly spacious and appropriate conditions will help fuel further progress toward reaching a new, lower steady state at which the same or greater number of animals can be served over time while modeling better conditions and care for all.

Even in a shelter operating within capacity and able to provide a quality environment for most rabbits, there may be individual rabbits who experience poor welfare despite best efforts. It is inhumane to house animals consistently exhibiting signs of fear, anxiety, and stress. Immediate action is indicated, which may include moving the rabbit to alternative housing on-site or in foster care, or to an appropriate outcome such as transfer, return to field, or euthanasia.

General facility considerations

When creating or choosing housing locations for rabbits, care should be taken to ensure a safe space permitting species-specific behaviors is provided, exposure to stressors is minimized, daily care tasks can be carried out in an efficient manner, and biosecurity can be achieved.

The environment around the primary housing unit will significantly affect a rabbit's well-being, affective state, and physical health. Lighting, the soundscape, temperature, air quality, and location are all important factors to evaluate when ensuring humane facilities for rabbits (see Fig. 3a).

Lighting

Light/dark cycles

The daily activity rhythms of domestic rabbits are driven primarily by light/dark cycles but can also be shaped by food access, external noise patterns, or other caretaking routines.[17] Wild rabbits are generally most active at night with peak activity seen at dusk and dawn. Disruption of natural daily rhythms leads to negative physical and mental/emotional health outcomes across species, including reduced adaptation to stress, altered immune function, and shortened lifespan.[18–20]

Rabbits should be housed in areas with access to natural light such as secure outdoor enclosures or inside rooms with windows, skylights, and solar tubes. When this is not possible, indoor lighting should be turned on and off to approximate natural light/dark cycles.

Light intensity

The minimum light intensity required for rabbits to visually orient themselves to other animals and to the environment is at least 3–5 footcandles [FC] (approximately 30–50 lux).[21] However, higher levels of illumination of up to around 30–50 FC (300–500 lux) are necessary for observation of the rabbits, daily cleaning, and care.[22] For reference, a clear night with a full moon is approximately 0.01 FC (1 lux), a school classroom is about 30 FC (300 lux), and a doctor's examination room may be 50 FC (500 lux).[23] As burrowing animals that tend to be less active during full daylight, constant exposure to higher light intensities may be stressful for rabbits and should be avoided.[21] Appropriate variation can be accomplished through the use of dimmable lighting that can be turned up during active cleaning and care and then turned down to lower levels during the rest of the daylight hours.

Sufficient darkness is also important; in fact, excessive light exposure may be more of a concern than insufficient light exposure, especially in the busy context of animal shelter. Some states may have mandatory nighttime illumination requirements for certain spaces that may make full darkness difficult to achieve. While providing a hiding space that allows for minimal external light penetration may help remedy this, whenever possible rabbits should experience full darkness during the nighttime hours.

Management of lighting on a timer system can help to avoid human error or staffing gaps that may impact the regular interval. Motion-activated lighting systems are best avoided, as the presence of rabbits in the environment may trigger such systems during night hours.

Furnishing the enclosure to allow for visual and light exposure choice for the rabbit occupants promotes coping with stress. The set-up also helps to balance the lighting needs of caretakers or potential adopters to be able to see into the enclosure.[21]

Exposure to sunlight/Ultraviolet B radiation

There is evidence that vitamin D deficiency is an underrecognized problem in pet rabbits living indoors and contributes to poor health outcomes.[24–29] However, neither optimal blood concentration levels nor daily nutritional requirements have been defined. Rabbits have the ability to synthesize vitamin D with exposure to ultraviolet B (UVB) radiation (from sunlight or an artificial light source) or acquire it through their diet. A diet consisting of good quality sun-dried hay (~70–85%), commercial pelleted rabbit food (5–15%), and fresh produce (10–15%) is believed to prevent vitamin D deficiency regardless of exposure to UVB radiation.[25]

However, indoor rabbits provided with supplemental UVB exposure show increased blood levels of vitamin D,[26,28,29] so some opportunities for exposure to sunlight (or artificial sources of UVB radiation such as UVB light bulbs typically marketed for reptile husbandry) may be beneficial to shelter rabbits. Whether UVB is provided by access to direct sunlight or an artificial light

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source, rabbits should always have the opportunity to manage their own exposure by having the ability to retreat from the light source when desired.

Noise control

Rabbits have sensitive hearing. Like humans they can hear low frequencies (low pitch), but they also hear ultrasonic frequencies (high pitch) and low volume sounds beyond human hearing range.[30–32] Hearing plays an essential role in communication between rabbits, interactions between people and rabbits, and supporting a rabbit's awareness of their surroundings.[5,30,33,34]

Noise exposures have also been documented to have adverse health and behavioral consequences in rabbits, humans and a range of other mammalian species.[35–42] Adverse effects include changes in endocrine, cardiovascular, gastrointestinal, and immune systems function; sleep–wake cycle disturbances; seizure susceptibility; wound healing; and an array of behavioral and mental health changes.[36,39]

Shelters should take all available opportunities to house rabbits in quiet quarters, away from areas with substantial activity or movement. Use of appropriate housing, predictable routines[34,38,43,44] and stable, positive social interactions (with compatible rabbits or humans)[45–48] may help reduce stress and fear responses to unpreventable noises. Loud or unexpected noises, including those outside of human hearing range, are likely to induce acute stress and fear responses.[35,49] In addition to compromising individual rabbit well-being, these responses are likely to affect interactions with human caretakers, potential adopters, or even cagemates. Fear reactions in rabbits include freezing (immobility and/or a lack of normal behaviors such as eating, grooming or hopping), flight and other escape behaviors (scratching and kicking of the hind legs), and offensive aggression including 'boxing' (lunging and scratching) or biting.[45]

Prolonged exposure to sounds in the 50–70 decibel (dB) range is detrimental to the hearing of rabbits.[50] For humans, a normal workplace conversation is about 50 dB, while a vacuum cleaner approximates a sound of 70 dB. Sounds in animal shelters associated with animals, people, and routine caretaking activities plus background equipment (Heating, ventilation, and air conditioning (HVAC), lighting, cleaning equipment, etc.) regularly exceed 100 dB.[35]

Engineering controls to manage noise levels in rabbit housing areas include architectural strategies that limit sound transmission or reverberation, maximize space between rabbit housing and dog housing, and avoid or modify metal-on-metal contact surfaces to limit clanging noise (cage latches, non-metal caging materials, etc.) (see Fig. 2). Administrative controls include utilizing behavior management or enrichment strategies to reduce barking, and training caretakers to limit noise generation in daily care activities via careful closing of cage doors, gentle placement of food dishes, managing conversation volume, keeping music at a low volume and turning it off at night, and maintenance of cleaning

Fig. 2. Use of quiet latches or low-cost tape retrofits on cage latches can support noise mitigation and other low-stress care protocols.

Source: Photo credit: BC SPCA/Bailey Eagan.

1 Location in Care
- Quiet area away from sounds and smells of other species
- Balance desire for adopter visibility with need for low-stress environment
- Near exercise area if not incorporated into primary enclosure

2 Climate
- "Rabbit Comfort Zone:" 59–72 °F (15-22 °C)
- Humidity: 30–70%
- Minimum of 10 air changes per hour

3 Lighting
- Indoor lighting should approximate natural light/dark cycles
- Range of 3–50 footcandles (30–500 lux) with dimmer control
- Access to natural light

Fig. 3a. Elements of humane rabbit housing and enclosure set-up.

equipment and environmental systems including HVAC and lighting.[51]

Air quality, air conditioning, heating, ventilation

Maintaining good air quality in rabbit housing areas is essential. Rabbits have a keen sense of smell with about 100 million olfactory cells compared to 30 million in humans.[52] Smell plays an important role in helping rabbits evade predators and in social communication with other rabbits.[52] Cycling air from areas housing predator species (dogs, cats) into areas housing rabbits should be avoided, as just the scent of predators can elicit physiological and behavioral reactions associated with fear and stress.[53,54]

Recommended parameters for temperature, humidity, and ventilation are summarized in Table 2. In general, rabbits can tolerate cooler temperatures as long as they are provided adequate nutrition as well as housing and furnishings that allow them to access a comfortable microclimate when needed (e.g., hiding box, deep hay or bedding, protection from drafts, clean and dry flooring surface, etc.).[52,55,56] Rabbits have a limited ability to tolerate high temperatures. Cooling can be achieved by providing shade, uncovered smooth flooring with space to stretch to help dissipate body heat, and access to wet surfaces, cooled tiles, chew-proof cooling pads, air conditioning, and air circulation at the level of the rabbit. Large and rapid temperature fluctuations (even within the optimal temperature range) are physiologically stressful, cause immune system suppression, and contribute to disease caused by *Pasteurella* bacteria (see Infectious Disease Management and Mitigation).[52]

Good ventilation is essential for rabbits to maintain physical comfort and support respiratory health.[52] Ventilation provides adequate fresh air, stabilizes the temperature and humidity of a room, and dissipates harmful gases, dust, and airborne pathogens. Limit exposure of individual animals to high velocity air movement (drafts) by thoughtful placement of enclosures indoors, or by providing shelter from wind and other weather elements within an enclosure for rabbits housed outdoors.

Good ventilation in combination with a minimum of once daily cleaning of the enclosure (defined as replacement of soiled litter material with spot cleaning of furnishings and surfaces) limits buildup of noxious gas such as ammonia. When cleaning, take care to limit the amount of dust that is stirred up into the air from hay or litter materials. Exposure to high levels of waste gas and dust contributes to the development and severity of respiratory disease in rabbits.[52] Enclosures with solid walls and covers may require active, low-velocity ventilation of individual enclosures to ensure respiratory health and overall comfort/well-being.

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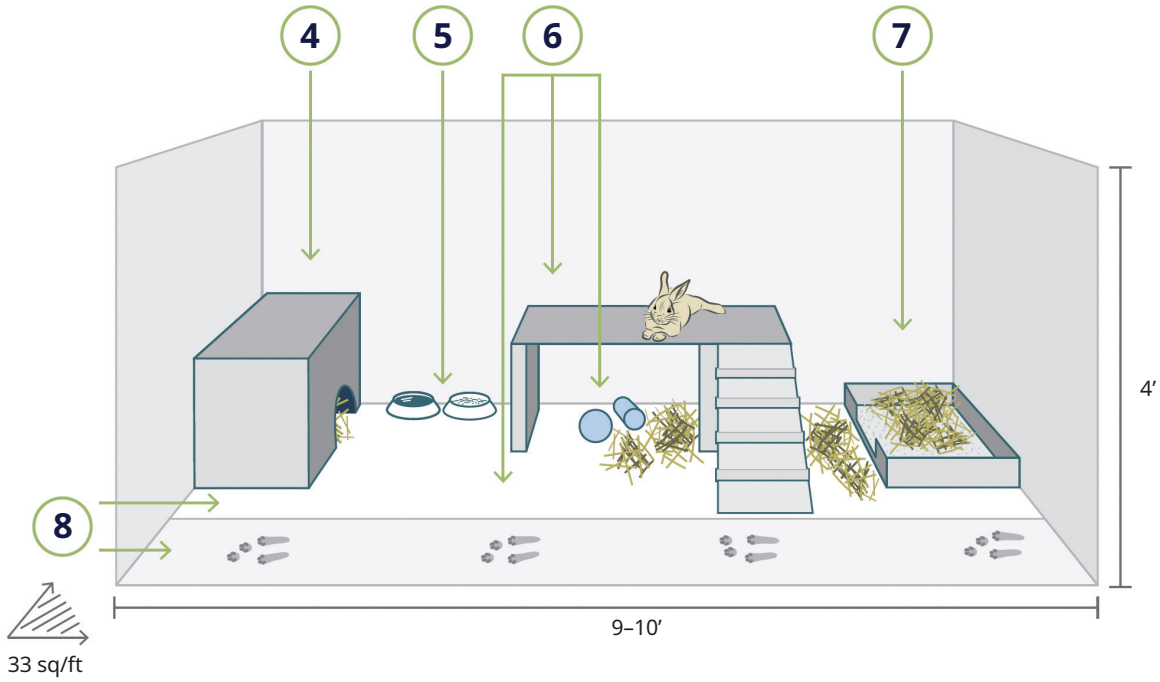

4 Resting/Hiding Area
- Enclosed, with refuge from light
- Contains nesting/bedding material
- Allows for fully outstretched position

5 Water & Food Sources
- Sturdy, safe materials
- Easy to clean and sanitize

6 Enrichment
- Space to exercise and play: 9–10 ft (2.7–3 m) to allow for 3
- consecutive unimpeded hops
- Structural complexity and elevation
- Toys, including food puzzles

7 Litter box
- Large size
- Located in corner or periphery
- Access to hay

8 Materials:
- Variety of non-slip flooring surfaces
- Non-toxic, non-porous, free of sharp edges
- Easy to clean and sanitize
- Clean, safe bedding

Fig. 3b. Elements of humane rabbit housing and enclosure set-up.

Table 2. Temperature, humidity, and ventilation parameters for maintaining optimal housing for rabbits

Parameter	Rabbit Comfort Zone*	Additional comments
Temperature	59–72°F (15–22 °C)[56,57]	Rabbits are very sensitive to heat stress at temperatures above 86°F (30°C). They can tolerate cold temperatures more easily. Providing cooling support or moving to a cooler environment is essential in warm temperatures.
Humidity	30–70% relative humidity (RH)[56]	RH above 70% decreases a rabbit's ability to tolerate high temperatures. *Note: although tolerated by rabbits, RH above 60% may promote growth of mold indoors.
Ventilation	Minimum of 10 air changes per hour[56]	Ventilation of the macroenvironment does not necessarily ensure adequate ventilation is being supplied to rabbits within their enclosure,[56] so adequacy of ventilation should be assessed at the level of each rabbit.

*Assumes generally healthy mature rabbits. Sick, very young or very old rabbits may have different requirements for comfort.

Exposure to other species and predators

As rabbits are prey species, it is important that housing be located away from the sight, sound, and smell of predatory species such as dogs, cats, ferrets, and carnivorous wildlife.[58,59] Rabbits require hiding spots in their enclosures. Ideally, when rabbits are group housed, they are provided with one more hiding spot than the number of rabbits.

Special considerations for outdoor housing

Climate and geographic location may play a significant role in the design of rabbit housing facilities. Appropriate primary enclosures can be created in both an indoor and outdoor settings.[58,60] However, in addition to the elements previously discussed, outdoor housing has specific features to consider.

Outdoor enclosures require protection from extreme weather and variable climate conditions, including provision of accessible shade at all times. In hot weather, cooling via fans or access to an air-conditioned space is essential. Misters are not recommended as damp conditions can increase the risk of dermatitis and flystrike and being wet may limit a rabbit's ability to thermoregulate. If temperatures are below 40°F (4°C), or if rabbits are subjected to considerably lower temperatures than to which they are acclimated, insulated shelter ± external heating should be provided.

Outdoor spaces used by rabbits must be free of toxic plants, fertilizers, mold, pesticides, and other toxic materials.[61] All precautions should be taken to exclude contact between wild and domestic rabbits, both through direct contact and potentially shared materials such as forage.[62] Outdoor enclosures must offer adequate protection from predators, which can include enclosure covers, wire fencing buried 12–24 inches (30–60 cm) deep, secure latches, and enclosures sturdy or heavy enough to prevent tipping[63,64] (see Primary Enclosure Materials).

Where infectious disease is endemic to a region, additional precautions are warranted to prevent transmission in the shelter. Newly admitted rabbits of unknown health status should be prioritized for screened indoor housing, as insect vectors play a role in transmission of some diseases, such as myxomatosis and Rabbit Hemorrhagic Disease (RHD). In areas with high risk for RHD, consideration for indoor vs. outdoor housing may include whether the patient has undergone quarantine and/or vaccination (see Infectious Disease Management and Mitigation).

Offsite and foster housing

Excluding housing at brief pop-up adoption events, any off-site housing or placement in foster homes should meet or exceed the standards of care and housing for shelters set forth in this document.

Primary enclosures

Rabbit enclosures typically seen in animal shelters and pet stores are insufficient to meet the needs of individual rabbits. Shelters often face constraints on resources, both spatial and financial, which can limit the type of housing they provide for their animals. It is crucial shelters provide a humane and enriched primary enclosure for rabbits in their care to support their health and well-being, and because adopters may look to shelter rabbit housing as a model for appropriate rabbit enclosures in a home.

Rabbits are active creatures, moving by jumping, hopping, and running, some covering distances of more than a mile (1.6 km) per day in the wild.[65] Depending on body size, the length of a hop can be up to 2.3 ft (0.7 m), longer if startled.[52] Enclosures that allow more freedom of movement (e.g. kennels, runs, retrofitted exercise pens), including the use of vertical space, are preferred.[56] Rabbits typically move at high speeds during play, which is more often seen in younger rabbits, and sufficient space for exercise, in all ages, helps to promote gastrointestinal and musculoskeletal health.[66]

A complete primary enclosure for a rabbit consists of four main areas:

1. Resting/hiding space
2. Elimination area, typically a litter box
3. Eating/drinking area
4. Exercise/play space

Because rabbits can vary widely in size, space requirements should be guided by using animal-based measures (including the natural activities and behaviors listed in this document).[67] A humane housing unit for a rabbit allows them to rest fully outstretched without touching the walls (or other rabbits, if co-housed); turn around unimpeded; stand up fully on hind legs without ears touching the enclosure ceiling; and take an unhindered sequence of three consecutive hops.[58] Appropriate primary enclosures allow for choice within the environment (e.g. to hide or not, to burrow or not, to socialize or not) to support behavioral health.[3] Optimally, for maximum versatility and flexibility of spaces, all rabbit housing would be adequate to house adults or juvenile/baby rabbits (See Special Populations). Figure 3b illustrates the key components of humane rabbit housing and enclosure set-up.

For many shelters, it will take time, planning, and fundraising to provide rabbits in shelters with enclosures that meet their needs. Even small, incremental changes can have a meaningful impact on rabbit welfare. Shelters that continue to take in rabbits in the interim must provide housing as described below while making a commitment to minimizing LOS.

Primary enclosure dimensions

Rabbits require a larger enclosure than most shelters currently provide. To meet the requirements for humane

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housing as described above, rabbit enclosures should offer an unobstructed path approximately 10 ft (3 m) long; this can be the length of one wall of the enclosure or the diagonal length between two opposite corners.[58,68] These relatively large space requirements are designed to allow rabbits to stretch out to full body length, take three consecutive unimpeded hops, and on the principle that a startled rabbit should be able to accelerate, decelerate, and stop without impacting a wall.[68] Rabbits with larger enclosures also exhibit more activity and interaction with their environment,[69] which may be more attractive to potential adopters.

When determining animal-based space requirements, age and activity level of rabbits may be more important than size of rabbit, with younger age and increased activity level requiring more space.[70] If open on top, the enclosure walls must be high enough to prevent escape; the minimum recommended wall height is 4.1 ft (1.25 m).[58] Enrichment items such as elevated platforms should be positioned away from the sides to prevent rabbits from using them to jump out. Higher walls or ceilings may be needed for large or very active rabbits. While creating spaces of this size for all rabbits in a pre-existing facility may present a challenge and require incremental changes, shelters planning new builds are encouraged to account for the space required to provide humane rabbit housing for all ages and sizes.

Guidance for primary enclosure and secondary exercise area floor dimensions is provided in Table 3. In recognition that some shelters may need to proceed stepwise toward improved housing, the table presents two options:

- **Minimum Recommended** dimensions refer to the minimum primary enclosure space needed for resting/hiding, elimination, and eating/drinking and *includes* exercise space that a rabbit can readily access on their own at any time.
- **Minimum Acceptable** dimensions refer to the minimum primary enclosure space needed for resting/hiding, elimination, and eating/drinking but *does not include* sufficient space required for exercise, which caregivers must provide separately on a daily basis.

Both Minimum Acceptable and Minimum Recommended housing dimensions shown in Table 3 include space for resting/hiding, elimination, and eating/drinking. Under the Minimum Acceptable housing dimensions, room for exercise is not included so rabbits must be given access to a space that is equivalent to the size of the Minimum Recommended housing dimensions for several hours each day. This setup is not preferred as it is known that rabbits with restricted access to exercise are more prone to musculoskeletal and gastrointestinal problems and have been shown to exhibit higher levels of corticosterone, a hormone associated with response to stress, as well as activity rebound when given access to a larger space, an indicator of prior behavioral deprivation and compromised welfare.[69,71]

Provision of a separate exercise area can be accomplished by moving rabbits to an exercise pen, meet and greet room, or other large, safe space of sufficient size (see Table 3) for several hours each day. Volunteers may enjoy these duties if staff time is limited. To align with natural behavior patterns, this should be done close to the hours rabbits are most active (dusk and dawn), rather than the middle of the day.[71] Housing rabbits in enclosures of Minimum Acceptable dimensions should be temporary (i.e., less than 2 weeks); rabbits with longer stays should be moved to a larger enclosure, foster care, or adoptive home. Even the Minimum Acceptable dimensions of 8–11 ft^2/0.8–1 m^2 can compromise welfare and therefore smaller enclosures are never recommended.[69,71]

Alternatively, the Minimum Recommended housing dimensions, which already include space for exercise, allow rabbits to use this area on their own at any time. It is far preferable for rabbits to have continuous, free access to an exercise space so that they may run at times that suit their individual needs, supporting the Five Domains.[71] This ability to exercise at will eliminates the potential stress from moving the rabbit away from their primary enclosure to a new environment for exercise as well as the caretaker time needed for such activities. While the Minimum Recommended enclosure size of

Table 3. Primary enclosure floor space for rabbit housing in animal shelters

Occupants	Minimum recommended for long term stays*	Minimum acceptable**	Exercise area***
Single rabbit	**33 ft^2**/3 m^2, with length 9–10 ft/3 m and width ≥ 3 ft/0.9 m[58]	**8–11 ft^2**/0.8–1 m^2, with length as long as feasible and width ≥ 2 ft/0.6 m	**33 ft^2**/3 m^2, with length 9–10 ft/3 m and width ≥ 3 ft/0.9 m[58]
Two compatible rabbits	**45 ft^2**/4 m^2 with length 9–10 ft/3 m and width ≥ 5 ft/ 1.5 m[58,71]	**18 ft^2**/1.7 m^2, with length ≥ 6 ft/1.8 m and width ≥ 3 ft/0.9 m	**45 ft^2**/4 m^2 with length 9–10 ft/3 m and width ≥ 5 ft/1.5 m[58,71]

*Long-term stays are those longer than 2 weeks.

**Enclosures of the minimum acceptable size should be considered *temporary* (< 2 weeks) as shelters make every effort toward providing larger housing while concurrently minimizing the length of stay for rabbits in shelter care.

***To meet the basic needs of rabbits housed in enclosures of the minimum acceptable size, daily access to an exercise area of this size is required.

33–45 square feet (3–4 square meters) is substantially larger than most current housing provisions for rabbits in shelters and will allow shelters to more fully meet rabbits' needs for short term care, even these allowances do not meet the space recommendations for rabbits living as pets in homes.

Primary enclosure materials

Enclosure materials should be:

- Non-toxic
- Predator-proof
- Non-porous
- Able to withstand repeated cleaning and disinfection
- Free of sharp edges

Latches should be secure from the interior and exterior of the enclosure, especially if located outdoors. Quiet latches are preferable to metal latches that may clang and startle rabbits (see Noise Control).

For rabbits housed outdoors, predator exclusion can be achieved by using strong mesh wire with holes

small enough to exclude the smallest local predators (e.g. 16g, 1 × 1 inch [25 × 25 mm] or smaller mesh wire) for the rabbit run walls. Chicken wire is not strong enough for this purpose. Deeply buried (12–24 in/30–60 cm) mesh wire can prevent predators from entering via digging.

Although not recommended for rabbit housing, if wood is used it should be sealed and regularly inspected for signs of chewing or wear. If painted, opt for non-toxic, VOC-free, water-based, pet-safe paint and ensure the product has fully dried and fumes have dissipated before using near rabbits.

Check all components of housing for maintenance needs regularly to ensure that they are safe and functional.

Flooring and bedding

Bedding serves a variety of purposes for rabbits. Mechanically, it provides traction on slippery surfaces and a soft surface on which to stand or rest. Appropriate bedding also supports expression of natural behaviors such as digging, foraging, and nesting, and regulates the rabbit's microclimate by providing thermal comfort. If the bedding includes hay or grass it also enhances their fiber intake.

Appropriate, well-maintained flooring and bedding is crucial for rabbit health. Slatted, grid, or wire floors should not be used where animals have direct contact with the surface due to the risk of injury and pododermatitis.[58,64] Pododermatitis is also a risk factor from any surface or condition that allows the buildup of urine and fecal material on feet (solid flooring surface or non-absorbent toileting space, limited grooming due to obesity or musculoskeletal disorders, etc.).[72] Ensuring bedding material is replaced when soiled can prevent urine scalding and pododermatitis due to moisture.

Smooth, slippery flooring surfaces are best minimized as rabbits tend to avoid moving on them. Additionally, rabbits are prone to musculoskeletal problems such as arthritis as they age, and slippery surfaces may exacerbate pain associated with these conditions or directly cause new musculoskeletal injuries due to slipping. Limiting rabbits to only slippery surfaces is likely to cause stress; however, providing a small area can offer a cooling surface in hot weather conditions.

To protect feet, support comfort, and offer behavioral choices, portions of smooth, slippery or other flooring can be covered using rugs, rubber or foam mats, woven grass mats, newspaper, sheets, or other linens. Some rabbits may chew these items and thus should be monitored to ensure they are not ingesting flooring materials that may lead to gastrointestinal obstruction or other illness. Take care to choose materials without small loops or fibers that can catch on toenails, and remove damaged or frayed bedding when seen.

As with other aspects of housing, the opportunity for choice is important when selecting bedding for rabbit enclosures. A variety of substrates as well as bare flooring without bedding should be available. Digging is a natural and emotionally satisfying behavior that can be supported by offering discrete areas of deep bedding material (hay, straw, fabric, dirt) or access to natural ground surfaces for rabbits housed outside.[55] The resting area should include soft bedding such as blankets, towels, straw, shredded paper, or paper fiber products to allow for nesting and burrowing.

Rabbits express location and material preferences within their enclosures under different conditions (temperature, rabbit age, etc.);[73–75] whenever possible, preference of the individual rabbit should be taken into account when selecting bedding materials.

Primary enclosure set-up

Attributes of appropriate resting/hiding area

All primary enclosures require a smaller enclosed, darkened area containing bedding/nesting material, mimicking natural burrows or tunnels. Items providing this function should be able to be cleaned, disinfected, inspected, and re-used or disposed of (e.g. cardboard box) between rabbits. The area should allow inspection of the rabbit(s) when necessary. The environment can be further enriched by selecting hiding structures with a solid roof to be used as an elevated resting platform. The size and space should allow the rabbit(s) to rest fully outstretched without touching the walls (or other rabbits, if co-housed).[58,68] Enclosures housing multiple rabbits should allow for all rabbits to hide simultaneously. This can be accomplished by providing one den per rabbit,

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optimally including a den large enough for multiple rabbits to hide together.

Litter boxes

Appropriate litter boxes for rabbits in shelters are made of safe, impermeable, and cleanable or disposable material.[58] Similar to litter boxes for cats, boxes for rabbits should be large enough to comfortably accommodate the rabbit's entire body and allow for proper posturing. Shelters should aim to provide at least one litter box per rabbit, preferably in a corner or on the periphery of the enclosure. Rabbits may preferentially choose a location to eliminate; the litter box should be moved to this location. Some rabbits are willing to use covered or high-sided litter boxes, but alternatives should be offered if rabbits are observed to eliminate primarily outside of the litter box. Rabbits should be given access to hay while in the litter box, either by including it in the box or providing it in a rabbit-safe hayrack (see example in Appendix B) that is reachable from the box.[58] Guidance for providing a safe rabbit litter box is offered in Figure 4.

Food dishes

Rabbits are grazers and foragers. Food should be provided in ways that encourage them to forage and explore (e.g. puzzle feeders, balls with feed, scattered, stuffed paper tubes or bags)[58,64] (see Secondary Exercise and Enrichment Spaces). Food dishes should be sturdy, and easy to clean and disinfect.

Water sources

Water sources should be inspected daily to ensure water is clean, available, and accessible. When possible, the water supply should be located in an area separate from both resting and elimination areas. At a minimum, the water should be separate from the elimination area. Containers should be sturdy and easy to clean and disinfect.

Preference of individual rabbits should be taken into account when selecting a water source. Rabbits tend to drink more from open dishes and therefore these are generally preferable to water bottles with a sipper tube.[76] Water bottles can be considered under specific circumstances such as a rabbit with a history of water bottle use, failing to use an open dish, medical or physical conditions limiting use of an open dish. Consider offering both for new rabbits in care. For a comparison of open dishes and water bottles, see Table 4.

Toys/enrichment items

The addition of species-appropriate enrichment items to a primary enclosure can help shelters meet the Five Domains of Animal Welfare and promote a positive experience while in care. Preferred enrichment offerings are based on a rabbit's biological need to dig, perch, play, chew, and hide. Enrichment has been found to decrease the frequency of abnormal behavior (licking, gnawing or nibbling at cages) in laboratory rabbits.[77,78]

Effort should be made to include an elevated resting place, as many rabbits show preference for using elevated platforms when provided with one.[79] Gnawing material is an important type of environmental enrichment for rabbits, as it allows them to perform a species-specific behavior to a fuller extent[80] and decreases redirection of gnawing to other rabbits in the enclosure.[81] A summary of enrichment options is provided in Table 5. Refer to Fig. 3b for an illustration of appropriate primary enclosure set-up.

Secondary exercise and enrichment spaces

If the primary enclosure cannot meet all enrichment needs, secondary spaces must be available to support the expression of species-typical behaviors and promote well-being through physical exercise, manipulative activities, and cognitive challenges.[56,82]

As previously described in the section on primary enclosures, enrichment enclosures should be large enough for rabbits to hop, jump, and make quick changes of direction, including the ability to take an unhindered sequence of three consecutive hops across an unobstructed length (approximately 9–10 ft [3 m]).[57,58,68] These spaces should include hay, water, a hiding space, and a litter box, as well as enrichment items such as toys, gnawing items, platforms, and other elements (see Table 5). Pens with sufficient height allow rearing upward for scanning, exploration, and play while ensuring that the rabbit cannot escape. A minimum recommended wall height for unsupervised rabbits is 4.1 ft (1.25 m).[57] It is important to notice that wire exercise pens are commonly only 3 ft (0.9 m) tall; a fitted bed sheet placed over the top of the pen can help prevent escape when such pens are used.

If an enrichment area is used for multiple rabbits at the same time, all rabbits must be able to collectively lie fully outstretched without touching walls or other rabbits. The space must also allow all rabbits to simultaneously run, jump, hop, dig, graze, forage, hide, and access resources. Hiding spaces are essential and should allow for all rabbits to hide simultaneously. This can be accomplished by providing one den per rabbit, optimally including a den large enough for multiple rabbits to hide together.[68] Dens with multiple exits prevent rabbits from becoming trapped by another occupant.

The area must be cleaned daily or between unrelated rabbits; if these areas are on grass, relocating the enclosure frequently is important. Rabbits are naturally more active at dawn and dusk[83]; therefore, timing of enrichment outside of primary enclosures may be enhanced by scheduling in these periods when feasible.

If rabbits are placed in an enrichment area for extended periods without supervision, they should be

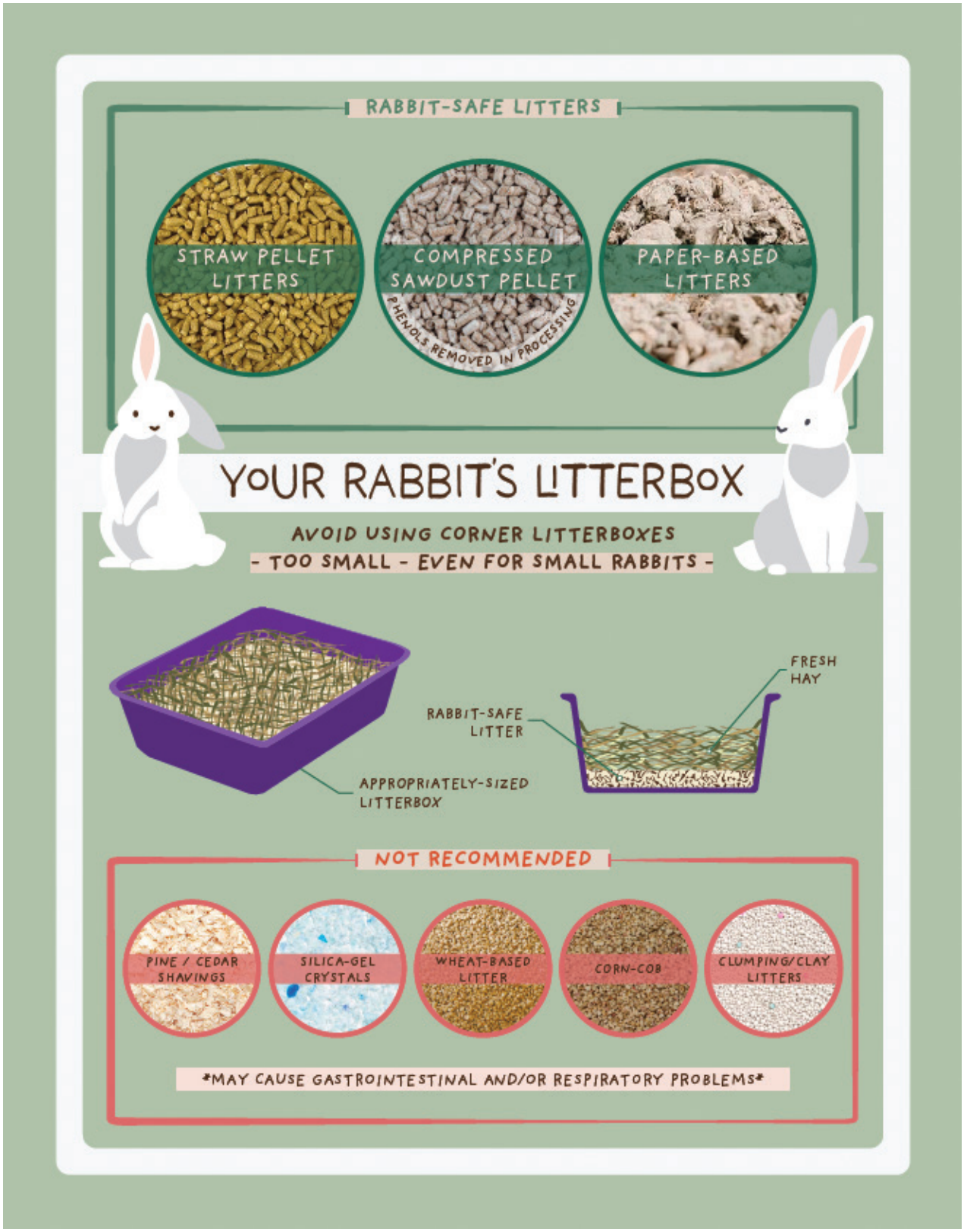

Fig. 4. Litter box substrates. Providing multiple litter options in enclosures and noting preferences provides both physical and behavioral benefits for rabbits.

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Table 4. Benefits and disadvantages of open dishes vs water bottles for water delivery

Open dish	Water bottle
Closer to natural drinking behavior	Unnatural posture for drinking
Prone to contamination with bedding, hay, feces	Leaks may moisten bedding and/or lead to loss of access to water
May pose a risk for neonatal rabbits*	Malfunction may be missed on visual inspection
Promotes increased water consumption	Saves space

*Dishes, if used, should be shallow.

Table 5. Means of providing enrichment within primary enclosures

Element	Examples	Comments
Structural complexity	Include platforms, ramps, boxes, etc. of appropriate height for individual rabbit	Ensure these are safe and able to be cleaned and disinfected or single-use and disposed of when soiled
Food	Employ puzzle feeders, scatter hay throughout the enclosure	Encourage foraging
Gnawing items	Allow for gnawing on safe materials such as apple, pear, willow, birch, maple, cottonwood, poplar, rose, kiln-dried pine or kiln-dried aspen branches, dried grape vine, rattan, or seagrass mats	Encourage normal gnawing behavior using safe, approved items
Toys	Offer toys made of safe materials, cardboard, or paper Introduce novel mazes/hideouts, tunnels	Toys should be varied and interesting to promote mental exercise
Digging	Provide digging opportunities in a safe outdoor space, or with a litter box or flowerpot filled with straw, dirt, hay, shredded paper, fabric, or turf	
Companionship	Curated companionship in rabbits can be a source of enrichment	See Cohousing section for more information
Exercise	Exercise time should be provided near the start or end of the day, avoiding the mid-day hours when rabbits are naturally less active.[5,71]	Increasing the duration and/or frequency of exercise time becomes increasingly important as length of stay reaches or exceeds 2 weeks.

checked frequently throughout the day to ensure their safety. Enrichment areas must not be used at the same time with other species, including birds and guinea pigs. Sanitizing shared enrichment spaces between occupants and particular attention should be paid to elimination of odors if predator and prey species are using the same space.

Special populations

Special populations refer to groups of rabbits whose unique life stages, medical conditions, or behavioral needs require tailored housing and care beyond standard shelter protocols. These populations may include pregnant or nursing does, very young or senior rabbits, surgical patients, and those removed from hoarding situations, all of which benefit from specialized approaches to ensure their health, welfare, and well-being. Many of these special populations of rabbits are better served by being housed outside of the shelter, except for brief periods of time related to the delivery of veterinary care. It is critical to recognize and meet the needs of special populations so the five domains of welfare can be achieved for each rabbit while in shelter care. Even robust management efforts and housing set-ups may not be sufficient to adequately meet the needs of these rabbits if housed in shelters for prolonged periods.[3] A veterinarian with expertise in care of rabbits at all life stages should be consulted regarding particular nutrition and husbandry, medical, and behavioral needs.

Pregnant, nursing, and baby rabbits

Special considerations include providing suitable space for does and growing rabbits, mitigating infectious disease risk, and providing appropriate enclosure set-up to allow does to express maternal behaviors.[79,81,84]

As with other species, when pregnant rabbits are admitted to the shelter, birth in the facility should be prevented if possible. Given limited adoption capacity in many facilities, spaying the doe is often the preferred option, or, if this is not feasible, sending the rabbit to foster care is preferable to allowing birth in the shelter.[3] If rabbits do give birth in the shelter, provide single housing during this time since does naturally separate from their social groups 2–3 days prior to kindling (birthing). Provide a nesting box and suitable nest building material, preferably hay, at least 2–3 days before parturition to allow does to mix their hair with provided materials to prepare a birthing nest. Provide additional bedding material to support both does and kits, especially in colder temperatures, and ensure housing units are placed in areas that avoid drafts.

Primary enclosures for does and kits need to be larger than minimum acceptable dimensions (Table 3),

particularly in terms of the length and height, allowing the doe to temporarily move away from kits in between nursing times, and to perform sentinel and exploratory behaviors. Platforms and elevated spaces also allow for does to perform such behaviors. A general recommendation is that kits are housed with does until 8 weeks of age, as earlier separation may compromise social learning.[58] If shelter or foster capacity is limited, this risk may be outweighed by the benefit of sending kits to adoptive homes as early as 6 weeks of age.

Senior/geriatric rabbits

Special considerations include addressing mobility and osteoarthritis concerns through provision of the following elements: non-slip, soft surfaces to allow for traction when moving; ramps to help movement between different levels of housing; low entry litter boxes with a layer of hay or straw for stability and easier access; and additional bedding material in colder temperatures to help with thermoregulation and pain control.[58,85,86]

Surgical patients

Special considerations for surgical patients include reducing stress and addressing medical and behavioral needs through the provision of quiet, low-stress perioperative housing separated from dogs, cats, and ferrets. Closely monitoring patient medical and behavioral status is essential to providing sufficient care. Whenever possible, rabbit surgery should be scheduled on days when cat and dog surgeries are not occurring. When medically appropriate and housing permits, keeping bonded pairs or trios together during the pre- and post-operative periods can improve well-being.

Rabbits are at risk of gastrointestinal stasis post-operatively. Providing sufficient space to encourage rabbits to ambulate and increase gut motility is a helpful adjunct to appropriate pain control, nutritional support, hydration, and other methods of gut motility management.[66]

Rabbits from hoarding situations

Special considerations for rabbits from hoarding situations include addressing injuries, reducing stress, and mitigating infectious disease transmission. It is important to allocate additional staff time to address any health or behavioral conditions requiring extra attention. Shelters should plan housing, care and dietary needs after a careful intake examination that identifies illness and injury (and documents findings for legal cases if applicable). It is reasonable to assume a chance of pregnancy for any intact does who do not have litters with them at intake. Co-housing (previously altered rabbits or same-sex bonded pairs or trios) should be provided for healthy-appearing compatible rabbits and single housing provided for injured or sick rabbits. Large, well-enriched primary enclosures that include multiple hiding areas should be used, as these rabbits may be fearful or less bold and less likely to want to explore outside of their primary enclosure. Animals being held for prolonged periods in legal custody naturally require additional space beyond what is described in these guidelines.[84]

Cohousing

Rabbits are a social and gregarious species. As such, single housing can cause loneliness, anxiety, and boredom and lead to the development of abnormal behaviors such as excessive wall-pawing, digging, or bar-gnawing and induce physiological signs of stress such as gastrointestinal disorders. Furthermore, isolation may prevent rabbits from performing natural behaviors such as allogrooming, cuddling, play, locomotion, and resting. In a shelter, these important considerations should be set against the practicalities of housing rabbits from different backgrounds in a way that prevents conflict between rabbits, minimizes LOS, and is within capacity of shelter staff to manage.

In shelters, single housing is often the option that balances practical constraints against the behavioral needs of rabbits. See Figure 5 for an algorithm to guide cohousing decision-making. As individual housing fundamentally does not meet the needs of many rabbits, minimizing the time that rabbits spend in shelters is critical. Additional ways to mitigate the potential harm of single housing in shelters include environmental enrichment and visual and olfactory contact with conspecifics.[87] As with any species, consideration should be taken when caring for rabbits, whether housed alone, in pairs, or in groups, including a well-structured plan for monitoring and maintaining welfare; expert veterinary advice should be sought if rabbits demonstrate signs of stress, aggression, or poor health.

Cohousing considerations

Cohousing decisions should be intentional. If rabbits enter the shelter system already bonded to another rabbit or group, every effort should be made to keep this social group intact during stay and through to adoption. If the existing group is larger than three, it is recommended that rabbits be split into groups of 2–3; grouping should be made with attention to maintain existing positive social relationships between rabbits.

Length of stay

Rabbits tend to experience longer lengths of stay in animal shelters than other commonly sheltered species.[10,88,89] Since shelter data suggest paired rabbits tend to stay longer than single rabbits (BC SPCA

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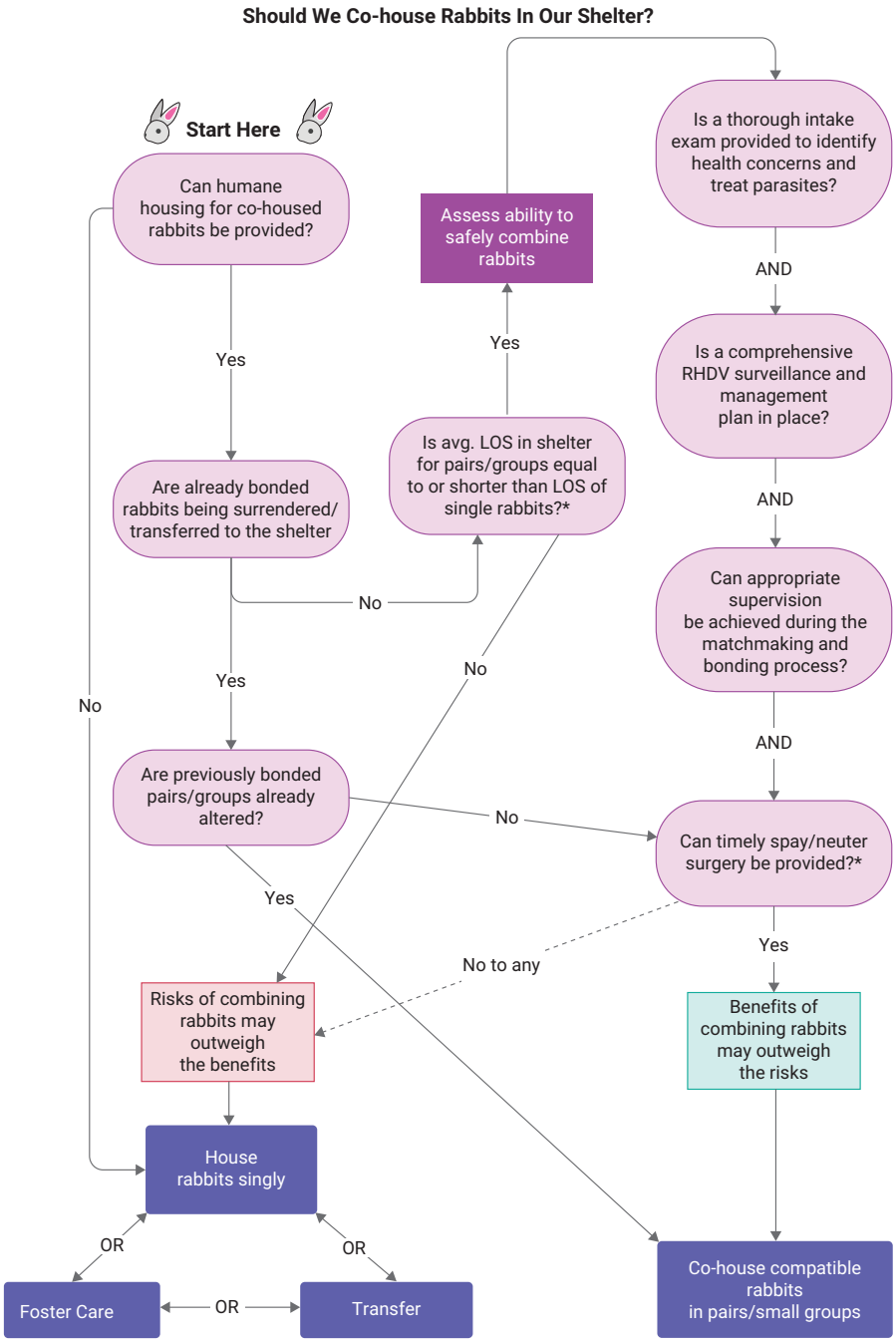

Fig. 5. Should we cohouse rabbits in our shelter?

*Rabbits of the opposite sex should remain separated for a minimum of 2 weeks following sterilization.

unpublished shelter data 2014–2022), shelters must balance benefits of cohousing with risk of increased LOS. As such, rabbits should generally be housed in shelters and made available for adoption as singles unless part of a previously bonded pair or trio. Pair bonding while in shelter care may be considered in cases where the benefits may outweigh an increase to LOS, such as a rabbit who has only lived with other rabbits and experiences high stress alone.

Health status

Rabbits may carry infectious diseases, and underlying health issues may compromise overall welfare, so a physical examination and appropriate parasiticides/preventatives are essential. Rabbits from different sources should be isolated from other individuals/groups until the appropriate quarantine period has been observed or RHDV vaccination series is completed, if indicated (see Infectious Disease Management and Mitigation).

Spay-neuter status

To be paired or group housed, all rabbits should be spayed or neutered. If already paired rabbits enter the shelter and are unaltered, spay/neuter surgery should be prioritized. A general recommendation is to not cohouse intact adult rabbits as serious injury and even death can result from fighting. However, for existing pairs or small groups of bonded rabbits awaiting spay/neuter surgery, this risk needs to be balanced against the daily comfort they can receive from the presence of another rabbit. Even same sex intact rabbits that have been cohoused previously may engage in fighting.

Compatibility

Although rabbits are highly social, they also have unique personalities and can have strong likes and dislikes for other rabbits. If not already in a bonded pair (or group), the bonding process will require time and expertise to create a compatible match. For group housing, it is important to consider the compatibility of individual animals. When incompatible rabbits are housed together, they may fight, which can lead to serious injuries or even death.

Enclosure and enrichment

Shelters should have diverse housing options, including single rabbit housing and housing appropriate for bonded pairs or trios. When bonding or co-housing is not possible or practical, barriers (e.g. baby gate, wire exercise pen) may be used between individually-housed rabbits to allow for limited social contact.[90] Pairs or groups of rabbits should all be able to perform the same behavior simultaneously; larger rabbits or larger groups (more than two rabbits) will need more space. Co-housed rabbits need to have sufficient space and adequate resources to minimize competition and allow them to move away from one another. Co-housed rabbits spend a lot of time 2–5 body lengths apart, which is the reason for the minimum width recommendation (≥ 5 ft/ 1.5 m).[71] Rabbits should only be exercised with their established companions; unfamiliar rabbits must not be mixed for exercise purposes. Each individual should have at least one hiding place, platform, water source, and toy/enrichment item. Ideally, at least one hiding space is large enough to allow for all rabbits in the enclosure to hide together.[68]

Sanitation

As with other species in the shelter, it is important to have a sanitation protocol for rabbits. Sanitation, which consists of both cleaning and disinfection, prevents disease and promotes well-being. Proper sanitation protocols aid in reduction of pathogens and infectious dose in the environment. Similar concepts of sanitation applied to dogs and cats can be applied to rabbits in the shelter setting.[3] Infectious pathogens of concern in rabbits may differ depending on geographic location but pathogens to consider when developing a sanitation protocol include RHD, *Encephalitazoon cuniculi*, and dermatophytosis.

Order of sanitation

Sanitation protocols should discuss the order of cleaning for rabbits to minimize the risk of disease transmission from sick to healthy rabbits. Healthy kits should be cleaned before healthy adult rabbits, and unhealthy rabbits should be cleaned last. In shelters quarantining rabbits for RHD, this population should be cleaned after the healthy populations if the same staff are cleaning all rabbit housing areas. The shelter should have separate cleaning supplies and equipment for healthy and sick rabbits and for quarantine and isolation areas.

Cleaning and disinfection

Housing facilities and enclosures, whether indoor or outdoor, should include materials that are easy to clean and disinfect. Cleaning is the process that includes removing visible organic material from the environment, washing with a detergent, rinsing, and drying. Disinfection is the process of killing or inactivating pathogens in the environment. In an animal shelter setting, it is crucial to use disinfectants that can destroy non-enveloped viruses (such as RHDV in rabbits).

Because rabbits are herbivores, their urine is alkaline (pH 7.5–9) and contains higher amounts of minerals and proteins than other commonly sheltered species; this can create mineral build-up on caging surfaces and litter boxes.[56,91] Most soaps are alkaline and can aid in removing organic material; however an acidic solution can be beneficial during the cleaning process to break down mineral deposits. Acetic acid (vinegar) is one type of acidic solution (pH 2–3) commonly used for this purpose when cleaning rabbit housing. Acidic solutions can be used for daily cleaning or used at specific times (e.g., prior to disinfection during deep cleaning).

Some products can be used as both cleaners and disinfectants in one step (e.g., accelerated hydrogen peroxide, potassium peroxymonosulfate). In heavily soiled areas or between residents, however, it is crucial these products are used in two steps: the first application to clean the area, and the second application at an appropriate contact time for disinfection. See Table 6 for a summary of products safe for use in sanitizing rabbit enclosures.

Spot cleaning and deep cleaning

Prior to cleaning, daily observation of fecal/urinary output and food consumption should be observed. Monitoring forms for each rabbit should be kept on or

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near the housing unit for staff to track appetite, fecal production and quality and urine production and quality. There are two main types of rabbit feces: a hard, dry fecal pellet and a large soft fecal pellet covered in mucus called a cecotroph. In healthy rabbits, cecotrophs are ingested directly from the anus, and, while some may be observed in the environment, if many are noted it could be a sign of underlying disease, and a veterinarian should be consulted. Use of a rabbit fecal scoring chart (readily available online) helps staff identify normal vs. abnormal fecal production for rabbits. It is also important to note that the urine of rabbits can contain porphyrins, which make the urine a red, orange or brown color and mistakenly appear to be blood in the urine.[66] A Wood's lamp can be used to distinguish porphyrinuria from hematuria.

Spot cleaning and deep cleaning for rabbits are utilized similarly to methods described for dogs and cats in shelters (see Table 7).[3]

During cleaning, rabbits should be removed from the enclosure to protect them from inhaling or ingesting any disinfectants. Disinfectants need to be used at the proper concentration and prepared per the label instructions. The disinfectant is applied to the surfaces once all organic material, bedding, food, and water are removed, and allowed to sit for the appropriate contact time. It is important that the disinfectant not dry before the contact time, as this can lead to disinfection failure. Many disinfectants require treated surfaces to be rinsed to remove potentially harmful residue (see Table 6).[96] Rabbits should only returned once the enclosure has been dried and aired out.

Table 6. Common cleaners and disinfectants used in sanitation of rabbit housing[92–95]

Product	Action and Use	Effective against	Additional considerations
Accelerated hydrogen peroxide	Detergent and disinfectant (most formulations recommend 2 steps)	Gram-positive bacteria Gram-negative bacteria Enveloped and non-enveloped viruses *Encephalitazoon cuniculi* Dermatophytes	Non-toxic at appropriate concentrations Has good activity in the presence of organic matter Typically requires a shorter contact time than other disinfectants, depending on concentration Rinsing optional*
Bleach (sodium hypochlorite)	Disinfectant (requires a detergent step prior to use)	Gram-positive bacteria Gram-negative bacteria Enveloped and non-enveloped viruses *Encephalitazoon cuniculi*	Inactivated by organic matter Can be irritating to skin, airways, and mucous membranes Requires good ventilation Requires daily preparation as it is easily inactivated by light Requires rinsing or removal of residue prior to returning rabbits to the enclosure
Potassium peroxymonosulfate	Detergent and disinfectant (when used twice in 2 steps)	Gram-positive bacteria Gram-negative bacteria Enveloped and non-enveloped viruses *Encephalitazoon cuniculi*	Can be irritating to skin, airways, and mucous membranes Requires rinsing or removal of residue prior to returning rabbits to the enclosure
Vinegar (10% acetic acid)	Detergent and disinfectant (limited efficacy)	Gram-positive bacteria Gram-negative bacteria Enveloped viruses	Not effective against unenveloped viruses (e.g., RHDV) Not recommended as primary disinfectant, but useful for descaling calcium deposits from urine

* Rinsing required for food and water dishes.

Table 7. Spot cleaning vs deep cleaning

	Spot cleaning*	Deep cleaning
When	Preferred method for daily cleaning when rabbit is remaining in or returning to their enclosure	For use when rabbit has vacated enclosure or enclosure is heavily soiled*
How	Remove soiled bedding, old food, urine, feces, litter Clean soiled areas with water +/- detergent as needed. Tidy area; rearrange unsoiled bedding and enrichment items Refresh food, water, and litter box	Remove all contents of enclosure Clean and disinfect enclosure, using appropriate wet contact time Rinse and dry prior to setting up for new rabbit
Why	To decrease amount of rabbit handling, stress, and staff time	To prevent spread of infectious disease and to ensure comfort for occupant

*Ensure rabbits are separated from the cleaning process, either via use of hiding space within enclosure or movement to separate compartment in the housing unit, a covered carrier, or an exercise space. It is unacceptable to spray or soak animals during the cleaning and/or disinfection process.[3]

Sanitation and prevention of infectious diseases

It is important to minimize fomite spread in the shelter setting by sanitizing any materials shared or used between multiple animals. Fomites include any object that can transmit pathogens from one animal to another such as handling equipment, food and water bowls, toys, and human hands, arms, and clothing.

Food and water bowls or water sippers should be sanitized regularly, and if they cannot be sanitized properly, discarded. After washing dishes and litter boxes, these items should be disinfected with a product effective against non-enveloped viruses. If appropriate bowls and litter boxes are not available, disposable versions can be used and disposed of between rabbits and during daily spot cleaning as needed. Bedding should be discarded or laundered between rabbits. Rabbit feed should be stored in a way to keep it protected from rodents, insects, and other wildlife, as they can contaminate feed with pathogens such as RHDV.

Organic material should be removed from soiled bedding prior to washing and drying. In cases where there are concerns of non-enveloped viruses and/or other persistent pathogens, specific laundry handling protocols should be utilized, or materials discarded to prevent disease spread.[3]

Human safety

Sanitation protocols should include information on staff safety, including personal protective equipment (PPE) requirements and hand hygiene. PPE requirements will differ depending on the population being addressed and the cleaning and disinfection specifics. Each housing area should contain a separate supply for PPE needed for staff to perform daily sanitation. Staff should have access to areas for hand hygiene, including sinks to wash hands with soap and water and access to hand sanitizer (60% alcohol or higher). Hand sanitizers are not effective against non-enveloped viruses or dermatophytes, so should not be utilized as the only method of hand hygiene. For healthy rabbits, it is recommended that staff should wear gloves or wash hands during daily cleaning and between rabbit enclosures. Staff caring for rabbits housed in quarantine or isolation areas, or those showing signs of illness should wear PPE appropriate for the disease of concern (may include gloves, gowns, ± dedicated footwear or shoe covers) and change these between rabbit enclosures.

Infectious disease management and mitigation

Like other domestic species found in animal shelters, rabbits can contract and transmit internal and external parasites as well as bacterial, viral, and fungal diseases. Basic preventive measures such as avoiding crowding and providing appropriate ventilation, sanitation, housing, and nutrition reduce the risk of infection and transmission as well as reducing the severity of clinical signs. In addition to these population health measures, rabbits should receive a physical examination at intake by a staff member trained to identify health concerns, including infectious conditions in rabbits, and make housing decisions accordingly.

This section will focus on rabbit diseases that have population health repercussions with specific implications for housing and are not covered by other shelter references. Treatment and management of specific infectious diseases will not be individually described here except where relevant to animal housing. The exception to this is RHD, an emerging disease in North America with a high mortality rate; detailed recommended management practices for RHD can be found in Appendix A. The Medical Health section of the ASV' Guidelines for Standards of Care in Animal Shelters contains general content that can be applied to rabbit medical care, veterinary recordkeeping, and response to infectious disease.[3] Readers are encouraged to access rabbit medicine textbooks and the ASV Guidelines for additional details.[3,66,97]

Both RHD and myxomatosis are considered reportable/notifiable diseases in several countries in North America and there may also be state or provincial reporting requirements; shelters are encouraged to be familiar with the list of reportable animal diseases in their region.

Quarantine versus isolation

As with all other housing areas, predator/prey species separation is required in quarantine and isolation areas. Additionally, separation from other small mammals may be necessary for certain infectious agents (e.g. *Bordetella bronchiseptica*).

Quarantine

It is important for shelters to have a plan for housing rabbits who need to be quarantined due to suspected or confirmed exposure to infectious disease, or when intake quarantine is required (RHD only; see Appendix A). In general, a quarantine period is used to monitor a healthy but exposed animal for signs of infection and is equal to the maximum incubation period of the infectious disease in question. Depending on the disease and resident population, quarantine areas may be separate rooms, separate primary housing enclosures within the same room, or off-site locations (such as veterinary facilities or foster homes).

Isolation

Shelters need a plan for housing rabbits who require isolation. The purpose of an isolation area is to separate infected animals from the rest of the population, preventing disease transmission. In general, isolation areas are distinct from quarantine areas (if the same area is used at different times, it should not be used for both quarantine and isolation simultaneously). Depending on the disease and resident population, isolation areas may be separate

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rooms, separate primary housing enclosures within the same room, or off-site locations (such as veterinary facilities or foster homes).

Select infectious diseases

External parasites

An intake examination should identify signs of external parasites such as fleas, ticks, and mites. If these are present, treatment initiation prior to placement in the general population protects other rabbits. Shelters can also design preventive parasite control programs (prophylactic treatment at intake) for external parasites highly prevalent in their region, as external parasites can also serve as vectors for other infectious diseases. Signs of mites include intense itchiness, crusting of the ears and/or skin, hair loss, and white flakes along the back.[66,97] Appropriate PPE (gloves, gown or long-sleeved lab coat; consider cap and shoe covers if entering a room-based enclosure) should be worn if mites are suspected, because all mites are contagious to other rabbits, and some species of mites are zoonotic.

Rabbits infested with mites or other external parasites can be treated with a product safe for rabbits as determined by a veterinarian. Contaminated bedding and objects should be discarded or laundered (including drying in a dryer), and contaminated housing environments cleaned and disinfected before reuse.

Internal parasites

Rabbits can become infected with protozoal parasites such as coccidia and cryptosporidium. These typically only cause severe disease in young rabbits under 6 months of age; if these are suspected due to clinical signs such as diarrhea, reduced appetite, or poor weight gain, a veterinarian should be consulted to assist with treatment, prevention, and environmental decontamination.[66,97]

Helminth parasites can also affect rabbits, including nematodes (pinworms) and cestodes (tapeworms).[66,97] These parasites may be observed directly or suspected based on clinical signs such as weight loss (clinical signs are not always present). If parasites are suspected, a veterinarian should be consulted. Rabbits with protozoal or helminth infections generally do not require strict isolation in their own room, but depending on the parasite, may need to be temporarily segregated during treatment and handled with additional biosecurity measures (see Sanitation). Housing decisions can be based on the parasite present in terms of risk and in consultation with a veterinarian. For example, a rabbit with a tapeworm that requires an intermediate host not found indoors would be handled differently than a group of young rabbits with diarrhea and enteric coccidiosis in a room with other young rabbits.

Encephalitazoon cuniculi is a microsporidian organism that spreads via spores shed in urine during acute infection for up to 3 months.[93] Infection is common, but many rabbits never show signs of illness, which can include neurologic, renal, and ocular signs.[66,93] Crowding, stress, concurrent medical conditions, and immunocompromise can make illness more likely. It is recommended that rabbits suspected or confirmed to have new infections be housed in separate enclosures from other rabbits, unless part of an existing bonded pair or group. These rabbits may pose a risk to immunocompromised people, necessitating precautions when indicated.

All internal parasites are shed in feces and/or urine, so daily cleaning including the removal of urine and feces is important in rabbit housing areas. Because some ova and spores are environmentally persistent, a disinfectant effective against durable pathogens should be used for primary enclosures between animals or groups, as well as for litter boxes and other potentially contaminated animal care supplies.

Bacterial diseases

Pasteurellosis, caused by *Pasteurella multocida,* is likely the most common rabbit bacterial disease encountered by shelters. *Pasteurella* bacteria can be present in healthy rabbits, and disease occurs when factors such as stress, crowding, pregnancy, poor nutrition, or other individual/environmental factors allow the bacteria to multiply beyond the mucociliary clearance defense mechanism of the respiratory tract.[97] When this occurs, clinical signs such as sneezing ('snuffles'), conjunctivitis, otitis media (middle ear infection), and abscesses can develop.[97] Large numbers of bacteria with increased virulence are shed when there are clinical signs, so there is an elevated risk of transmission.[97]

Pasteurella can be spread via direct contact, fomites, or airborne transmission.[97] Rabbits with active clinical signs of infection can remain co-housed with bonded, already-exposed rabbits, but should be housed in a separate room due to risk of airborne transmission, or if this is not possible, a primary enclosure at least 6 feet away from other rabbits.[98] While it is not realistic to eliminate *Pasteurella* entirely, if Pasteurellosis is a persistent clinical problem in a sheltered population, underlying factors such as crowding, poor ventilation, and stress need to be corrected.

Bordetella bronchiseptica is commonly found in the rabbit respiratory tract; it is often subclinical, but disease can occur with stress, crowding, co-infection with other pathogens (such as *Pasteurella*), poor environmental conditions, or particularly pathogenic strains.[66,99] When clinical signs occur, they typically involve the respiratory tract, eyes, and middle ear.[99] Environmental/population management is similar to *Pasteurella*, but this organism is mentioned separately here because of the potential for transmission to and from other commonly sheltered species such as guinea

pigs (who can develop severe, fatal disease), cats, and dogs. Many references historically recommend that rabbits and guinea pigs be housed separately due to this risk.[66,97,99]

Treponema paraluisleporidarum causes 'rabbit syphilis', a highly contagious sexually transmitted disease that occurs in both domestic and wild rabbits but is not contagious to non-rabbit species.[66,100] Clinical signs include distinctive lesions consisting of crusting, ulceration, and scabs in the facial and anogenital regions.[66,100] Subclinical infection is also possible, and clinical signs may develop due to stress.[66] If lesions consistent with syphilis are noted at intake, it is recommended that affected and in-contact rabbits be isolated with PPE (gloves, gown or long-sleeved lab coat, cap, shoe covers) used for animal care, and a veterinarian consulted regarding treatment.

There are a number of other bacterial diseases that can affect rabbits that are beyond the scope of this document; shelters are encouraged to consult a veterinarian experienced with rabbit medicine for support if bacterial infection is suspected.

Fungal diseases

The most significant fungal disease with population health significance in shelter-housed rabbits is dermatophytosis. This contagious, zoonotic fungal infection of the skin, hair, and nails can be found in indoor, outdoor, and laboratory rabbits. The most commonly diagnosed dermatophytes in rabbits are *Trichophyton* spp, *Microsporum canis,* and *Microsporum gypseum*; the rabbit's environment plays a role in which dermatophyte species is most likely to be found.[66] Neither *M. gypseum* nor *Trichophyton* will fluoresce under a Wood's lamp and thus a negative Wood's lamp exam should not be used alone to make housing decisions for rabbits with skin lesions. Clinical signs, diagnostics, treatment, and population management are similar to those of other species. Rabbits suspected or confirmed to have dermatophytosis should be isolated (bonded pairs can stay together) and cared for with full PPE (gown, gloves, cap, shoe covers) in separate housing areas from unexposed rabbits until treatment is complete and a veterinarian has determined they are no longer contagious.

Viral diseases

Myxomatosis is a viral disease that is enzootic in wild rabbits along the West coast of North America and is occasionally seen in domestic rabbits in that region.[66] Transmission occurs via arthopod vectors and direct contact.[66] In domestic rabbits, this disease is nearly always fatal.[66,97] Clinical signs include lethargy, fever, anorexia, seizures, subcutaneous lesions (facial and around other orifices), and skin hemorrhage.[66,97] If rabbits are showing signs of myxomatosis at intake or during a shelter stay, they should be immediately isolated in housing separate from the general population with full PPE initiated and a veterinarian contacted promptly.

Rabbit hemorrhagic disease

RHD is a serious and usually fatal illness caused by the calicivirus Rabbit Hemorrhagic Disease Virus, (RHDV1 and RHDV2).[101] Since 2020, the RHDV2 virus, has spread rapidly across North America and is expected to pose an ongoing threat to both wild and domestic rabbits.[102,103] Shelters that house multiple rabbits from different community sources pose a high-risk environment for transmission and mass mortality due to RHD.[104]

Clinical signs of RHD include sudden death, inappetence, lethargy, fever, difficulty breathing, jaundice, and bleeding from orifices.[66,105] Shelters may encounter RHD in shelter rabbits or when carrying out field services. In a shelter, cases are most likely to occur in recent intakes (who entered during the incubation period of 1–9 days[105]) or in unvaccinated rabbits with ongoing outdoor exposure (direct or indirect via feed or objects). Findings that should raise the suspicion of RHD in the field include finding multiple deceased adult rabbits in good body condition in the same area, with no obvious signs of trauma, and with blood from orifices.[106] A lack of blood from orifices does not rule out RHD, and cases that are otherwise suspect with no bleeding should still be handled as possible RHD.

Rabbits suspicious of RHD need to be isolated immediately in a separate housing area from other rabbits, with full PPE, and a veterinarian consulted promptly. Treatment of clinically affected rabbits is generally not recommended in shelters due to the high mortality rate and risk of transmission.

Although routine incoming quarantine periods are rarely indicated for domestic shelter animals, RHDV2 poses a particularly severe risk to a general population of shelter rabbits and affected shelters and sanctuaries have experienced 100% mortality due to death or depopulation.[107] The decision to quarantine specific incoming rabbits or incoming rabbits in general at a specific shelter is made using a standard method and based on a risk assessment (see Figure 6).

In addition, all shelters need RHD prevention and mitigation plans developed in consultation with a veterinarian familiar with the shelter facility and population as well as regional risk.[106] An example of such a plan is provided in Appendix A.

Conclusion

This document is offered as a guide toward better alignment between the care shelters are able to provide for rabbits, and the care rabbits need to thrive. The authors recognize the gap between the recommendations presented in these guidelines and the current reality in many shelters is dauntingly wide. However, we must begin

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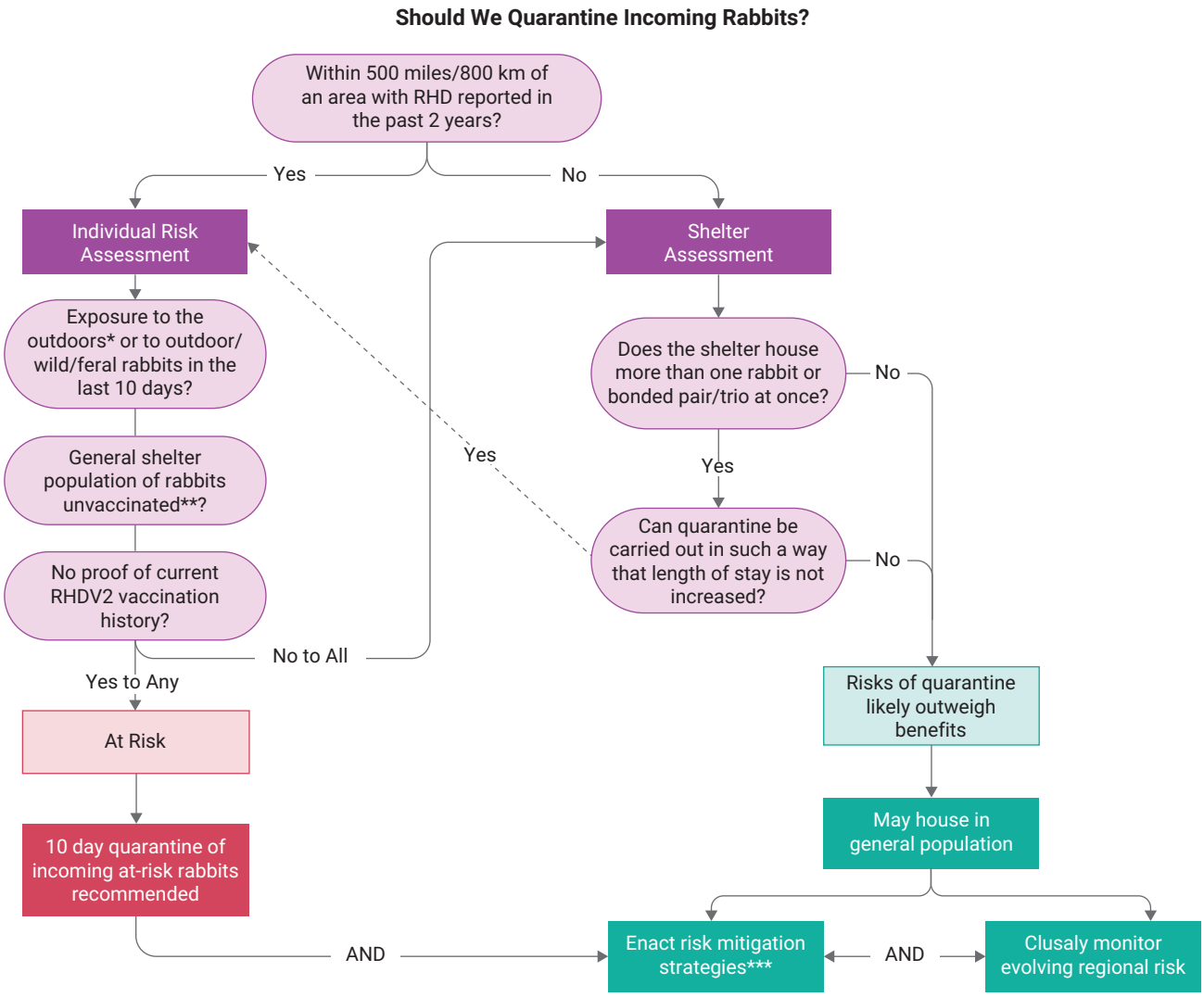

Fig. 6. Decision-making algorithm for mitigation of RHDV transmission in a shelter.

*'Outdoors' is used to describe the following:

- locations where wild rabbits may have frequented or lived
- access to vegetation collected from the outdoors
- locations where predators of wild rabbits live

**Medgene (RHDV 2) vaccination 'fully' protective 14 days after the second vaccination booster (35 days after initial dose) Filacav (RHDV 1 & 2) vaccination has onset of immunity at 7 days. Eravac (RHDV 2) vaccination has onset of immunity at 7 days:

***In general, an RHD prevention and mitigation plan for domestic rabbits should include the following elements:

- Maintaining the shelter rabbit population within the capacity for humane care
- Providing housing that meets or exceeds standards for materials, layout, and space
- Taking a consistent history of all incoming rabbits
- Creating a case definition and response plan for suspect cases, including immediate isolation and reporting to relevant government authorities where required
- Training field services, shelter staff, and volunteers on RHD recognition, prevention, and response
- Vaccinating all incoming rabbits in affected or potentially affected regions
- Quarantining some or all incoming rabbits based on assessment risk (see RHD Quarantine Planning Flowchart)
- Implementing biosecurity protocols that include both PPE and order of care from lowest to highest risk to minimize risk of transmission between primary enclosures
- Obtaining and storing feed, browse, treats, and chewable enrichment items in a manner that minimizes risk of introduction of contaminated items
- Maintaining sanitation protocols that target durable non-enveloped viruses including RHDV2
- Managing the population proactively in a manner that minimizes LOS and limits the number of at-risk rabbits on site at any given time

somewhere. Some changes can be made quickly, while others will take longer term planning and fundraising. Regardless, each incremental step toward improved housing has benefits for rabbit health and welfare. Happier, healthier rabbits can move more quickly to positive outcomes, freeing up just a little more space and time for further improvements.

Housing improvements can even have a galvanizing effect on the organization as a whole. Shelter staff and volunteers are in shelters because they care deeply about the well-being of animals. Being better able to meet rabbits' needs can substantially improve morale, while chronically poor housing has an undermining effect. An investment in housing, for a species that has been historically overlooked, signals a level of respect for all animals and those who care for them, and models humane care for every person who walks in the shelter's doors.

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Appendices

Appendix A: Rabbit Hemorrhagic Disease prevention and mitigation

Rabbit Hemorrhagic Disease (RHD) is a serious and often fatal illness caused by the calicivirus Rabbit Hemorrhagic Disease Virus (RHDV1 and RHDV2).[101,105] Since 2020, the RHDV2 virus, has spread rapidly across North America and is expected to pose an ongoing threat to both wild and domestic rabbits.[102,103] Shelters that house multiple rabbits from different community sources pose a high-risk environment for transmission and mass mortality due to RHD.[104] Due to this risk, RHD is described more extensively in this Appendix.

All shelters need RHD prevention and mitigation plans developed in consultation with a veterinarian familiar with the shelter facility and population as well as regional risk.[106] These recommendations are not intended to supersede local, state, provincial, territorial, or federal requirements. Shelters that admit wild rabbits for rehabilitation should work with a veterinarian with wildlife training as well as their state or provincial veterinarian to create protocols specific to wild rabbits.

Prevention and mitigation plan

In general, an RHD prevention and mitigation plan for domestic rabbits includes the following elements[62,102,108,109]:

1. Maintaining the shelter rabbit population within the capacity for humane care
2. Providing housing that meets or exceeds standards for materials, layout, and space (see Primary Enclosures)
3. Taking a consistent history of all incoming rabbits
4. Creating a case definition and response plan for suspect cases, including immediate isolation and reporting to relevant government authorities where required
5. Training field services and shelter staff and volunteers on RHD recognition, prevention and response
6. Whether or not vaccinations will be provided and providing appropriate flea medications to all incoming rabbits in affected or potentially affected regions
7. Quarantining some or all incoming rabbits for 10 days based on assessed risk (see Figure 6)[101]
8. Implementing biosecurity protocols that include both PPE and order of care from lowest to highest risk to minimize risk of transmission between primary enclosures
9. Obtaining and storing feed, browse, treats, and chewable enrichment items in a manner that minimizes risk of introduction of contaminated items
10. Maintaining sanitation protocols that target durable non-enveloped viruses including RHDV2[105]
11. Managing the population proactively in a manner that minimizes LOS and limits the number of at-risk rabbits on site at any given time

Incoming quarantine considerations

Although routine quarantine periods at intake are rarely indicated for domestic shelter animals, RHDV2 poses a particularly severe risk to a general population of shelter rabbits and affected shelters and sanctuaries have experienced 100% mortality due to death or depopulation.[107] The decision to quarantine specific incoming rabbits or incoming rabbits in general at a specific shelter is made based on a risk assessment.

Elements of this assessment should include:

- Regional risk
- Individual history including vaccination status
- Intake type
- Size of resident population
- Vaccination status of resident population
- Housing/room layout
- Average LOS and whether it will be meaningfully increased by a quarantine
- Anticipated outcome

Suspect cases must not be housed with the quarantine population and must be strictly isolated and handled in accordance with direction from the state or provincial veterinarian. If a case occurs in a quarantine area, the quarantine clock should be restarted.

In general, rabbits under quarantine need to:

- Be spatially separated from other rabbits (individual primary enclosures in a dedicated room or area)
- Have PPE used for care and changed between every primary enclosure (gowns, gloves, shoe covers, caps)
- Remain available for positive outcomes such as foster, return-to-owner, or adoption where feasible while segregated from the general population

Quarantine decisions will vary between organizations and even between incoming rabbits within an organization.

General factors that may decrease the need for quarantine include:

- Not being in or near a recently (within last 2 years) affected geographic area
- Individual incoming rabbits with current vaccines
- Having a very small resident rabbit population

General factors that increase the need for quarantine include:

- Being in or near a recently affected area
- Incoming rabbits who are not known to be vaccinated
- Rabbits who have had contact with the outdoors or with wild/feral rabbits in the last 10 days
- Having a large resident rabbit population

Shelters that decide not to quarantine despite being in an area of local risk are strongly urged to vaccinate all rabbits. Regardless of vaccine policy, adopters of rabbits adopted with no quarantine period or within the quarantine period should be informed to monitor for signs of RHD via a standardized disclosure.

Appendix B: Photos illustrating elements of humane rabbit housing

Fig. 1. Example of a housing unit that, at 15 ft^2 (1.4 m^2) of floor space, meets (and slightly exceeds) minimum acceptable dimensions listed in Table 3 while still providing hiding space, enrichment, and separation of sleeping and elimination areas. An additional exercise area is provided for rabbits housed in these enclosures (Figure 2).

San Diego Humane Society, CA, U.S.A.

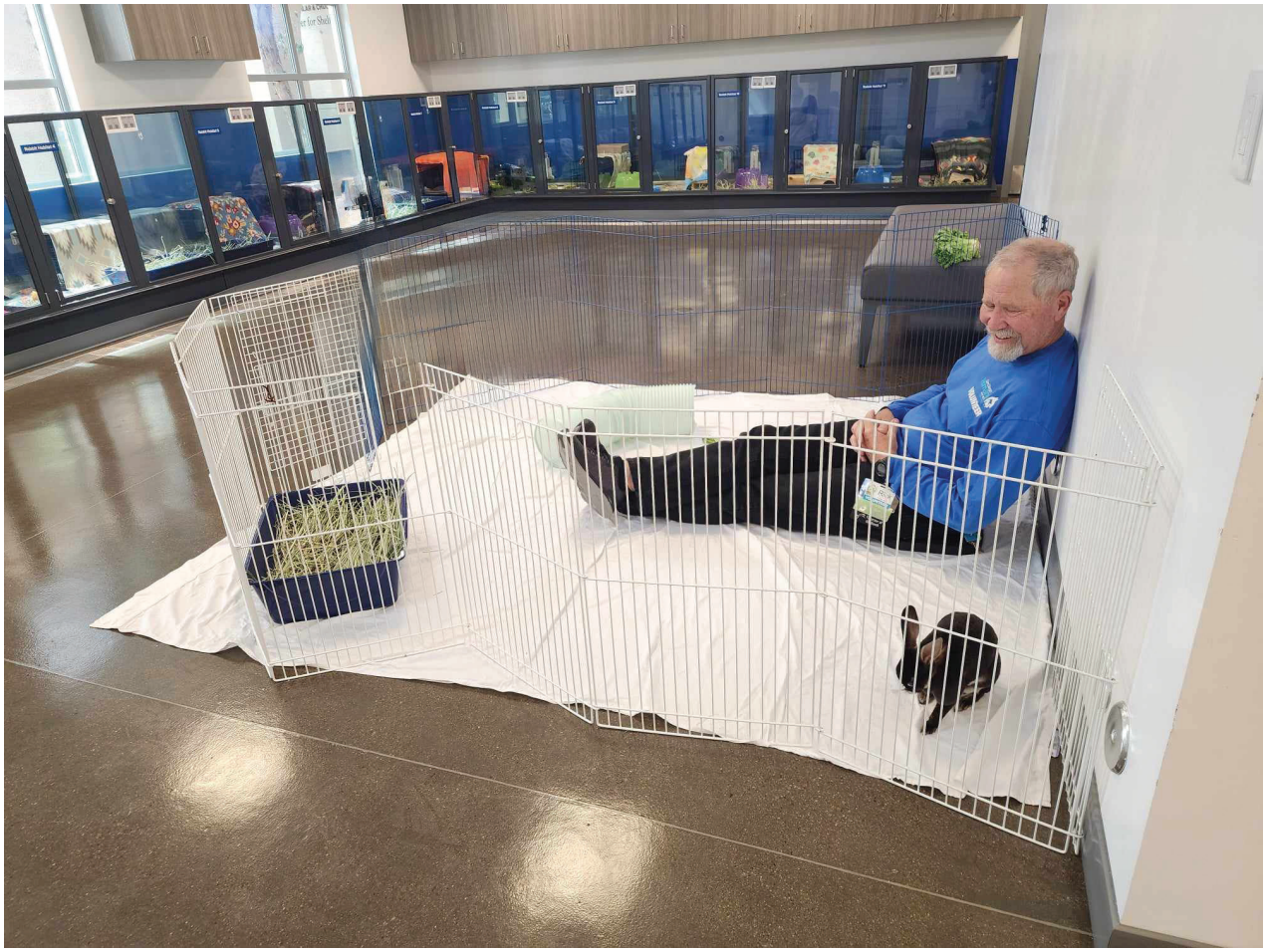

Fig. 2. Example of exercise space and volunteer interaction at San Diego Humane Society, CA, U.S.A.

Fig. 3. Example of pair housing, approximately 30 ft^2 (2.8 m^2). Rabbits have ability to spend time in separate areas of the enclosure. Note natural light, multiple litterboxes, water sources, enrichment, large hiding area. San Diego Humane Society, CA, U.S.A.

Fig. 4. Dog kennel converted to rabbit housing. Note size wide enough for pairs, multiple hiding spaces, varied floor substrate, use of vertical space. BC SPCA Vancouver, BC, Canada.

Fig. 5. Note varied floor substrates, food puzzle toys, chair for visitor, and combination hay rack feeder/litter box.[1] The Bunny Cafe, Vancouver, BC, Canada.

Fig. 6. Example of large enclosure for small group housing, including multiple hiding areas, use of vertical space, varied flooring materials, and ability for community members to enter. The Bunny Cafe, Vancouver, BC, Canada.

Fig. 7. Foster home enclosure > 45 ft^2 (4.2 m^2) with doe, bonded female, and babies. Note the width is greater than 5 ft (1.5 m), availability of multiple resources (hiding spaces, litter boxes, water dishes, enrichment items, etc.). BC SPCA, Vancouver, BC, Canada.

Fig. 8. Shelter enclosure for pairs or trios. Not multiple hiding areas, variety of flooring surfaces, elevated space, ladder, toys, gnawing material, tunnel, natural light, and access to sheltered outdoor enclosure. Space is large enough for visitors to enter enclosure for visiting with rabbits. New Westminster Animal Shelter, New Westminster, BC, Canada.

[1]Combination hay rack feeder/litter box from https://juniorsjobs.com/.