RSPCA Wildlife Rehabilitation Protocol: Hedgehogs

RSPCA

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Hedgehog © RSPCA

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Protocol for the rehabilitation of Hedgehogs.

Contents:

Note: highlighted sections of text are areas where further research is required.

1 Introduction

The RSPCA's Wildlife Centres and the Wildlife Department have prepared a series of husbandry protocols for the different species that are admitted to the Wildlife Centres.

The protocols have been produced by amalgamating the working practices from each centre into one document which has then been discussed at a workshop before being agreed by RSPCA staff. Any areas where agreement cannot be reached are then highlighted as areas for future research.

Where possible, an expert (from outside the RSPCA) on the behaviour and ecology of the species in question was invited to attend these workshops so they could offer advice and comment.

These protocols are based on the experience and knowledge of our wildlife centre staff and are supported by research demonstrating their success. They are subject to review and updates will be added as and when required. New protocols will also be added over time.

This protocol contains general information only. The RSPCA makes no warranties, representations or undertakings about any of the content of the protocol (including without limitation any as to the quality, accuracy or fitness for any particular purpose of such content).

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To the extent permitted by law, the RSPCA does not accept liability for any loss arising out of or in connection with the use of this protocol.

2 Species information

2.1 Species or group of species covered by this protocol

Species common name European or Western Hedgehog
Species scientific name Erinaceus europaeus

2.2 Hedgehog natural history

Adult hedgehogs as discussed in this protocol are defined as those that are one year old or older (survived one winter).

Young hedgehogs as discussed in this protocol are defined as those hoglets that are up to 6-8 weeks old and underweight juveniles at hibernation.

Hedgehogs are mammals with short rotund bodies with distinctive spines. They are of the order Insectivora and family Erinaceidae. The European hedgehog is one of 14 species of hedgehog found world-wide. An adult animal is instantly recognisable due to its characteristic spiny coat. The spines are hairs which have evolved to be a stiff spine as a response to repel predators. This, along with the hedgehog's ability to roll up into a ball, makes it a very difficult meal for predators. Despite this protection against predators they can be predated by badgers, foxes, dogs, pine martens, polecats and large birds of prey. Rats may prey on juveniles. Initial reaction of a hedgehog to danger include erecting their spines, if time running away. However their main defence involves rolling into a tight ball with spines bristling in all directions. Other defensive actions include hissing, screaming. and occasionally biting.

Adults measure 225-275 mm (head body length) and their weight will vary between 400g to 1200g in the UK, depending on age and season. Some animals have been recorded at close to 2 kg. They can live 7-10 years, with an average of 3 years.

It should be noted though that the African pygmy hedgehog is now a common pet in the UK, but it would be illegal to release one into the wild. This species can be distinguished from the Eurasian hedgehog by its paler underside; the vestigial toe on the hind foot; and larger ears. However if you are unsure, check with someone who has experience and knowledge of both species.

Guide to aging young hedgehogs:

New born	Neonates are about 6-10cm long, pink, hairless. Instantly white spines bud. Eyes and ears closed. 7-25g Umbilical remnant may be visible.
36hrs	First brown spines show.
7 days	50g. Hair not yet visible
14 days	Eyes open. Can curl but not fully roll up. White & brown spines equal length.
21 days	First teeth appear. Eyes & ears fully open. Full set of brown spines. 100g
28 days	Mini adult. Able to lap and eat solid food. Can roll up fully.
6 weeks	Most young hogs are weaned at this age. 225-310g
7-9 weeks	250g - 300g. Permanent teeth begin to erupt
6-8 wks	Fully weaned and will be leaving nest to fend for themselves. Third set of dark spines which last 2-3 years

Diet: Hedgehogs are primarily insectivores, but are generally omnivorous. This means that the bulk of their diet is made up of invertebrates i.e. slugs, caterpillars, beetles, earthworms etc. Small vertebrates are sometimes eaten, including carrion and eggs will also be taken.

Juvenile hedgehogs should put weight on rapidly. They tend to double their weight by seven days and can weigh 10 times their birth weight at 40 days, but not always. Such weight gain slows at weaning and then picks up again as the animals need to double their weaning weight for hibernation.

Habitat: Hedgehogs can be found in a wide variety of habitats including farmland, deciduous woodland, hedgerows, suburban gardens, golf courses and urban parks; any appropriate habitat which contains sufficient prey and nesting materials. They are solitary most of the time except during courtship and breeding. Hedgehogs usually establish a home range, which can vary in size depending on type of habitat and sources of food. Normally the home range can be 10 – 35 hectares depending on type of habitat and food availability and home ranges will generally overlap with those of other individuals. Individuals may travel as far as 3 - 4km in one night. Juveniles disperse in their first months of independent life. Territorial aggression between males is rare, avoidance is the norm. Hedgehogs are nocturnal and activity during daylight hours is usually a sign of ill health although nursing mothers can be found occasionally out in the day foraging for extra food. Otherwise hedgehogs rest during the day in nests constructed from vegetation and individuals are known to use the same nesting sites on a regular basis.

Breeding: Most matings occur post hibernation with peaks in pregnancies in May-July and another peak in September. Average 4-5 per litter, usually just one litter per year (occasionally 2) born from May-September. Juveniles become sexually mature at 12 months. (see table below).

Hibernation: There are thought to be several triggers for hibernation; prolonged ambient temperatures below 5.5^0C are thought to be important, but other factors such as reduced day-length, food availability and accumulation of sufficient reserves of body fat are also probably involved. The hedgehog will construct a special nest called a hibernaculum and will hibernate when conditions are correct. During hibernation, the hedgehogs body temperature falls below 10^0C, metabolism, (including heart & respiratory rate) is greatly reduced and energy consumption is minimised. Hibernation may occur in hedgehogs that live in warmer climates and is never continuous with hedgehogs becoming active during milder periods throughout the winter. This demonstrates that hibernation is an adaptation that has evolved to allow the hedgehog to survive in the UK.

Self-anointing: This extraordinary behaviour has been well documented but is still poorly understood. It occurs when the hedgehog encounters particular substances, usually with a strong smell or taste, such as dog faeces, for example. It will then chew and lick the substance and then it will anoint itself with the spittle it produces as a result. The hedgehog may do this quickly or it may take more than an hour, with the animal contorting itself to try and reach various parts of its body. The list of substances known to trigger this reaction is extensive and no correlation has been found to link this process with breeding, seasons, diet etc. Hedgehogs are noted for becoming totally engrossed in this behaviour when it occurs and may often appear dazed afterwards. When it occurs in

captivity, it could be seen in animals of any age and so should be noted, but there is no need for concern.

2.3 General information on species (or group) as relevant to care in captivity

Live in overlapping home ranges, not territorial but do not typically choose to co-habit.
Capable of climbing over tall walls as long as they can get a foothold, ie. dry stone wall.
Classed as insectivores, other food types eaten but do not play important role in diet requirements.
Generally nocturnal – may be cause for concern if reported as being out during daytime.

2.4 Importance of Environmental Enrichment

All wild animals have particular responses and behaviours which allow them to function in their natural environment. Some of these behaviours may be recent adaptations while others may have developed millennia ago, but all have evolved as responses to various stimuli in their environment. It is important to allow animals to express these behaviours when deprived of their natural environments in order to minimise stress. Minimising stress is an important factor in the care of any casualty, as increased stress will increase the time it takes to effect a cure.

Environmental enrichment is the term used to describe facilities that are provided for the animal which allow it to express these behaviours. A simple example is the provision of a variety of climbing branches for arboreal species, such as squirrels, or a suitable substrate for animals that dig. The aim is to try and fulfil three requirements of the animal:

- Biological functioning – the ability of the animal to function in its environment;
- Coping – the ability of the animal to maintain itself in response to environmental challenge;
- How the animal feels about its environment.

Environmental enrichment can also play a role in how the animal is managed. For instance, when feeding animals that either hunt or scavenge, the food should be hidden, and challenges provided, so that the animal has to spend time finding and obtaining food, rather than just eating it out of a bowl. A variety of prey types is also important. The hedgehog has a varied diet, depending on location, habitat type and season. This should be reflected in the diet provided, especially with young animals who are learning about what is and is not good to eat.

Environmental enrichment can either be naturalistic or artificial. Either is acceptable, provided that the artificial allows the animal to express natural behaviours.

BIOLOGICAL & PHYSIOLOGICAL VALUES OF THE HEDGEHOG

Parameters	
Weight	Average Adult 600g – 1200g (fluctuates seasonally) Peak weight by 3 years of age. Males generally larger than females, but there is a lot of variation between individuals and so this should not be used as a method to determine sex.
Sexing	Male: preputial opening usually mid-belly Female: vulva and anus short distance apart
Oestrus	Normally polyoestrous
Sexual maturity	9 – 11 months old
Breeding Season	April/May to September/October (litters can be as late as October)
Breeding age	1 year.
Gestation	35 days +/- 4 days
Litter size	3 –5 (occasionally up to 8) 1-2 litters per year
Birth Weight	8 – 25g
Eyes open	13 – 16 days
Weaning age	5 - 6 weeks
Life expectancy	Average 2 years maximum 6-8 years, 10 years in captivity
Temperature (rectal)	34 –37 C (93.2 – 98.6 F)
Respiration	Normal rate 20- 25 breaths/min
Hibernation weight	450 – 550g (1st season juvenile)

Fig 1: African pygmy hedgehog

Fig 2: Young European hedgehog

Note the differences between the two species – the African pygmy hedgehog's underside is paler and its ears are much larger.

3 Pre-admission treatment.

This part of the protocol is to summarise information for telephone queries regarding the rehabilitation of this species, prior to receiving a sick or injured animal at a RSPCA Wildlife Centre. There are two possible scenarios:

1. A member of the public is reporting a sick/injured animal and wants further information as to what to do;
2. Prior to admission, some animals may be held at a veterinary surgery or other facility. Some, if not all, of these facilities may request information on care of the animal, before they send it to an RSPCA centre.

3.1 Information should be collected on the following:

a) Species
b) Extent of injuries, evidence of shock
c) Body condition, any previous injuries
d) Age of animal, including weaned or unweaned
e) Male or female? If adult female, is she lactating/pregnant?
f) Location animal was found (important to ensure it is returned to the same place)
g) All records of previous treatment (if from another establishment)
h) Weight

Fig 3: Weighing a hedgehog

3.2 Advice related to care, e.g. diet, provision of heat etc.

Try to get an idea of diet. It should be similar to centres recipe.

3.3 Advice related to the treatment of particular problems.

Keep litters (siblings) together but avoid creching unknown animals at this time (see 5.1). Hoglets should be separated at weaning age (around 250g).
Do not group adult hedgehogs.
Check any suspicious skin problems
Ask if examined under general anaesthetic or not.
Ask if any ticks were removed

3.4 Advice regarding the fitness of the animal for transport.

Towel for base and paper in box. No hay or straw should be used.

4 Health and Safety

4.1 Introduction

The RSPCA has developed the Wildlife Centre Protocols to provide guidance and advice on the keeping of certain species of wild animal for rehabilitation. Anybody who intends to treat sick, injured and/or orphaned wild animals must accept that there are risks in doing so. Some wild animals are potentially dangerous and may be capable of causing serious injury. Furthermore, all wild animals have the potential to carry parasites, disease and bacterial infections. Some of these may be passed to humans (zoonoses) or to other animals, either domestic or wild. Barrier nursing methods should be used to minimise the spread of these infections between animals.

4.2 Risk assessments

It is recommended that any establishment admitting hedgehogs should complete risk assessments for all areas.

This is a brief summary of some of the possible risks and suggested ways to reduce the effects.

Members of public are advised to keep dogs etc away from hedgehogs.

Hazards	Control measures	Level of risk
Disease (salmonella)	Gloves should be worn when handling	Low
Parasites (ringworm)	Gloves should be worn when handling Treatment areas must be cleaned thoroughly after examination	Low

Table 1: Potential hazards and measures that can be taken to reduce the risk from these hazards.

5 Decision making – to treat or not to treat

5.1 Information should be collected on the following:

a) Species
b) Extent of injuries, evidence of shock
c) Body condition, any previous injuries
d) Age of animal, including weaned or unweaned
e) Male or female? If adult female, is she lactating/pregnant?
f) Location animal was found (important to ensure it is returned to the same place)
g) All records of previous treatment (if from another establishment)
h) Weight

5.2 Triage

Options for the animal are: euthanasia, treatment or immediate return to the wild. The considerations listed below will help to guide this decision.

5.2.1 Assessment relevant to the condition of the animal

Gloves should always be worn when handling hedgehogs due to the risks of possible zoonoses, such as ringworm.

How to uncurl a hedgehog: Even severely injured hogs can stay in a ball therefore anaesthesia may be required to examine fully. However one method to try is holding the hog with its head downwards over a flat surface. The hog may instinctively reach for the surface enabling the carer to grasp the back legs, (wheelbarrow position) extending the body for examination.

Fig 4: The normal defence posture for a hedgehog is to roll into a ball so it will need to be uncurled to examine it properly.

If the animal is very seriously injured it will be in immediate need of veterinary care. Note that multiple injuries give a poor prognosis. Euthanasia is an appropriate option for any of the following:

- Severe damage to the nose i.e. fractures which cannot be stabilised
- Severe maggot infestation, several orifices and deep invasion of tissues
- Congenital deformities in hoglets
- Female with fractured pelvis
- Compound fractures.
- Severe wounds exposing organs
- Fractured spine with associated nerve damage
- Animals with amputated limbs or animals that are blind. It has been shown that hedgehogs that are missing a limb are not as efficient at grooming and so carry a higher parasite burden than would be expected.
- Compound fractures.
- Chronic skin problems Need to investigate effects of ringworm infection and treatment on survival
- Hogs under 55g: Rearing hoglets at this age is intensive and requires specialist treatment, so should only be done where resources and specialist care are available. These animals should be euthanased if there are no resources available for this.

5.2.2 Assessment relevant to the centre and the management of the animals e.g.

a) Is a vet available to see the animal?
b) Space can be an issue. Numbers may increase in autumn. Other centres and private carers may need to hold for longer, until space is available.
c) What are current staffing levels?
d) What is the predicted intake of animals in the short term?
e) Diagnosis?
f) Management of ringworm

5.3 Initial treatment

On arrival:

Hedgehogs, along with all wildlife casualties, should be weighed on admission, as this will be used as a baseline to monitor the condition of the animal during care.

Adults: Assess hydration state – if dehydrated provide warmth and fluids; administer fluid therapy under vet supervision where necessary.
Check for injuries/wounds i.e. maggots etc
Individual adults should be kept separate

Hoglets: Assume that the casualty will be at least 5% dehydrated on admission. Therefore warmth and fluids should always be the first response to a casualty. Administer fluid therapy under vet supervision where necessary

Check for injuries/wounds i.e. maggots etc
Stimulate to urinate/defecate
If more than one hoglet mark each one with drop of water based paint (applied with cotton bud) for identification

Previous texts have suggested that baby hedgehogs need to be kept at 35°C (normal body temperature). It is true that baby hedgehogs seem to be rather poor at maintaining their body temperature for the first two weeks (work by Walhovd,1981), but it should be remembered that in nature (after the first few days) the mother goes out foraging all night and leaves the babies in the nest when ambient temperatures can be quite low. Orphan hedgehogs therefore require a (furry) heat pad at 35°C which the babies can snuggle up to when they feel chilly and move away from when they feel hot and they should not be over-dependent on this heat source after the first two weeks. Having a body-heat source in the nest is not the same as keeping the entire nest/cage at 35°C.

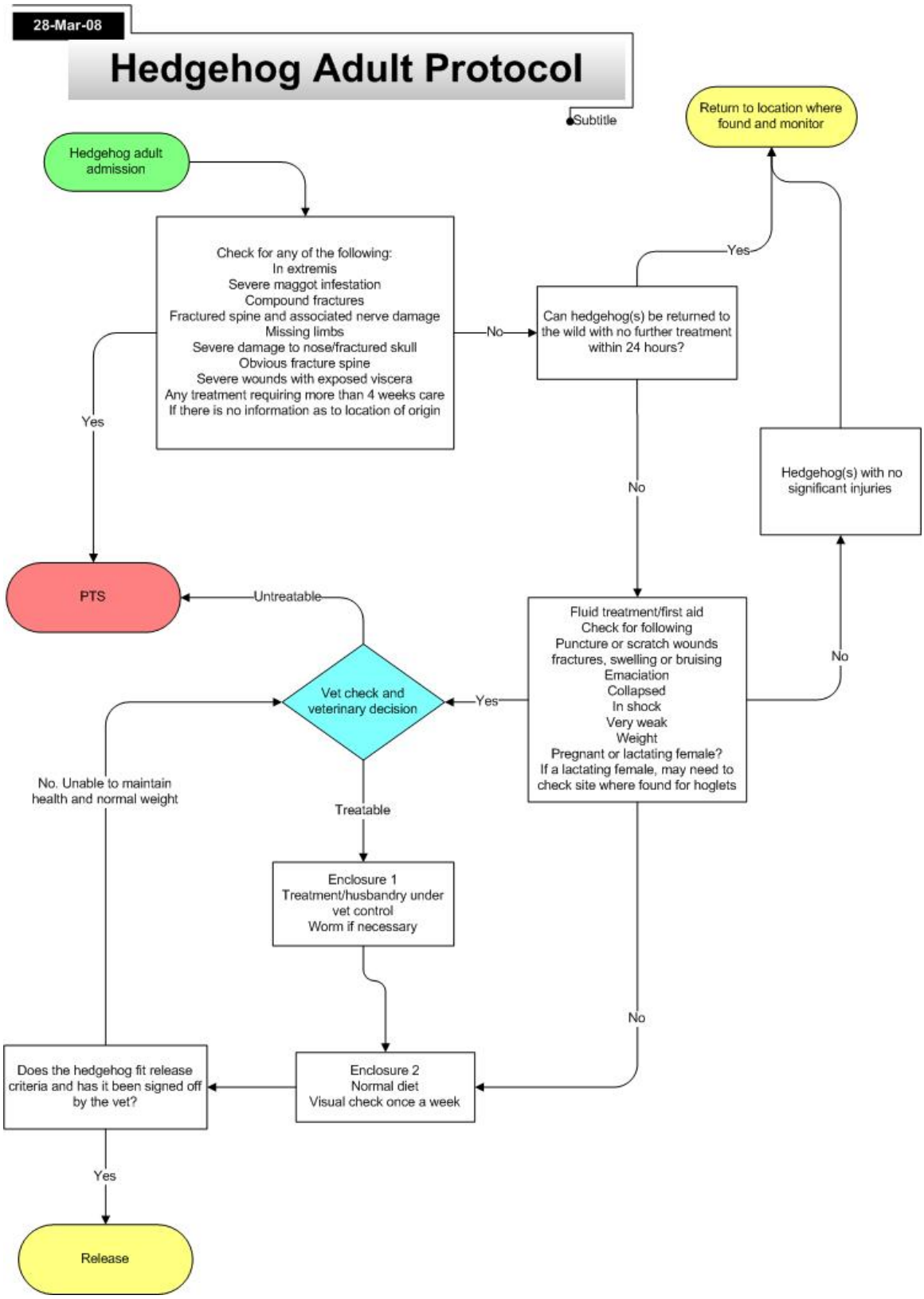
When the hoglet has been warmed, feed with a rehydration fluid i.e. lectade using a syringe and teat. Experienced handlers can stomach tube, which may be preferable to prevent inhalation pneumonia or if the hoglet won't feed. For this a 25 gauge cannula tube should be used; e.g. Cooks naso-gastric tubes for stomach tubing, measured from tip of nose to last rib for length to reach stomach.
Never feed a hypothermic hoglet.

Individuals should be kept separate for 48 hours for quarantine purposes

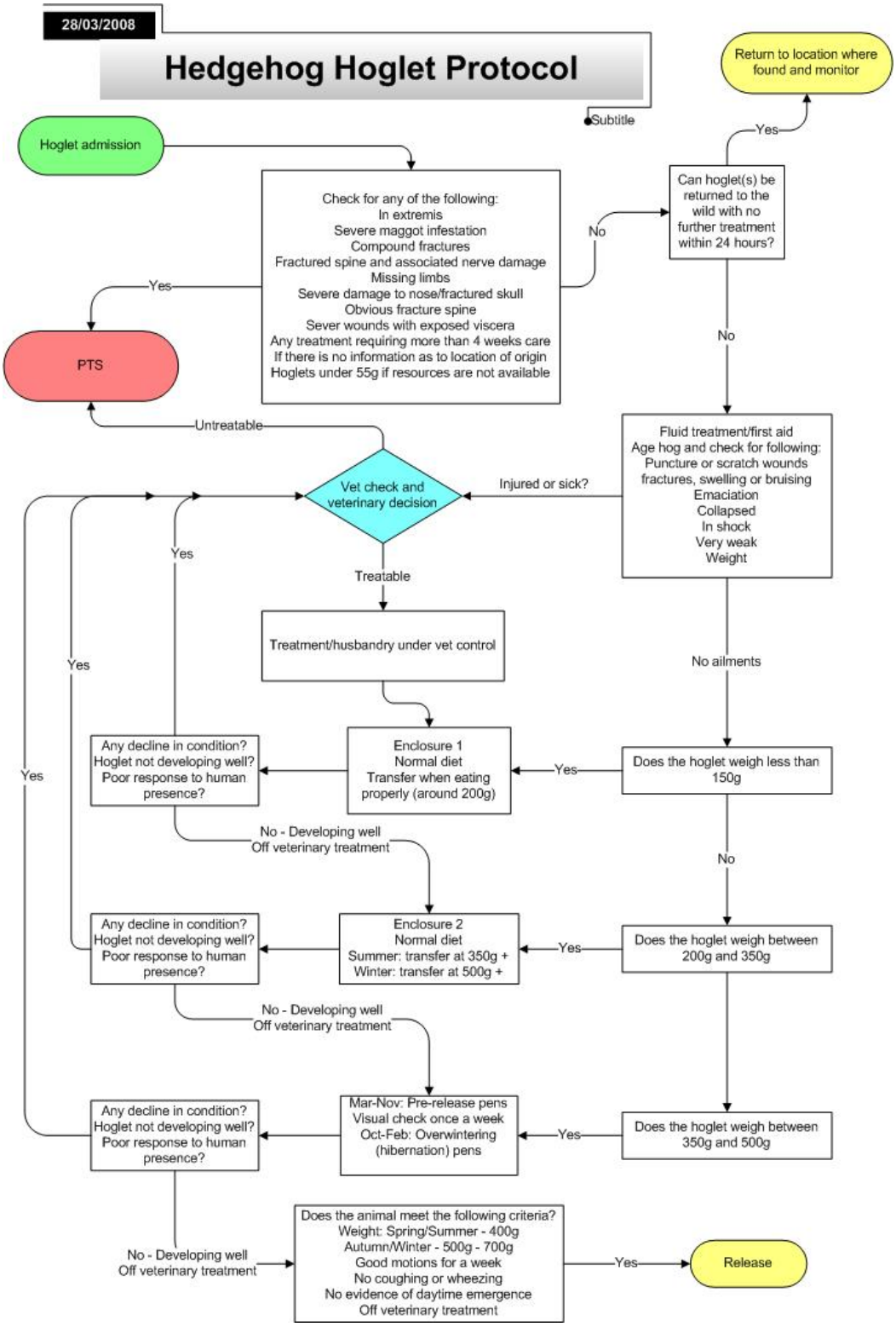
Injured mother and hoglets
A mother and hoglets should always be left alone if possible. However should they be brought into care then there should be minimal handling. With very small hoglets there is a risk that the mother may kill her babies, therefore if the mother is in need of veterinary treatment it may be necessary to separate mother and babies. If the hoglets are at least a couple of weeks old then they should be housed with the mother in a hutch in a quiet location and disturbed as little as possible. The mother should only be handled to administer treatment and the hoglets weighed once weekly unless concerned. Hoglets can be separated from mother when they can feed for themselves. Mother can then be released back where found and the hoglets can be reared as normal.

Endoparasites
Hedgehogs are prone to a variety of internal parasites including lungworm, intestinal nematodes, tapeworm and flukes. Healthy hedgehogs live with a moderate number of parasites in the wild, but in stressed, debilitated or young animals, internal parasites can become a burden and can lead to death.
It is important to release hedgehogs with a background level of internal parasites, as a hedgehog, once released back into the wild, will become re-infested and may not be able to cope with a sudden burden. A faecal sample should be collected within the first 24 – 48 hours of the hedgehog coming into care to assess parasite burden, especially if showing any of the following signs.
All hogs that arrive should be assessed for worm infections and treated accordingly. If under this weight on arrival, they should be wormed as soon as possible after they reach that weight. Treatment should be administered under vet supervision
Lungworm: Causes wheezing, coughing, gurgling, snuffles, respiratory distress and loss of appetite and weight.
Intestinal capillaria: Loss of appetite & weight, diarrhoea, anaemia, enteritis with blood in faeces, restlessness
Both infestations usually result in a secondary bacterial infection so appropriate antibiotic cover should be administered under veterinary supervision.

5.4 Flow chart for adult hedgehogs



5.5 Flow chart for young hedgehogs



6 Accommodation

6.1 Indoor 1 (ADULTS - intensive care)

Enclosure

Hedgehog casualties should be individually housed in a plastic crate or stiff cardboard box with wire lid, 80cm long, 45 cm wide and at least 50 cm deep, or a small cage such as a small vari-kennel or skipper cage 50 x 30 x 30cm. A small size of mesh should be used to prevent the animals becoming trapped by putting noses or limbs through the mesh. Single occupancy only. Shredded paper should be provided for bedding and a small bowl of water should always be available.

Lighting requirements

Wire lid can be covered at one end to create dark space for sleeping with a face cloth or an old towel (not ripped) or a sheet of newspaper, for cover.

Substrate

The box/crate can be lined with newspaper and provided with a towel, therefore any discharges, urine and faecal matter can be easily monitored and a faecal sample should be collected for analysis of internal parasites (see later) with shredded paper at one end. Towels and vet bed blankets can be used with very ill hogs but do not use if frayed or holed.

Temperature

The first 24 - 48 hours: Collapsed hedgehogs should be provided with a heat source. They could be placed in an incubator wrapped in a towel. Alternatively they can be housed in a crate but with a snuggle pad, gel filled hot water bottle or lamp or placed in a cardboard box with a heat pad underneath covered with a towel to prevent over-heating. Provision should be made to allow hog to move away from heat if it wishes to do so
ALWAYS CHECK THE HEDGEHOG IS NOT TOO HOT!

When to move from Indoor 1 *to* Indoor 2

When treatment has been completed and the hog is seen to be gaining weight.
Particular individuals may need long term care or a period of acclimatisation. Otherwise can go straight to release

Fig 5: Cardboard pet carriers like these are ideal for hedgehogs.

6.2 Indoor 1 (HOGLETS - intensive care)

Enclosure

Hoglets – up to 150 g

These should be housed in a small plastic crate, or cardboard boxes 50 x 30 x 30cm or incubator. Cardboard boxes and crates can be used with a wire lid. A towel or similar covering can then be placed over the lid at one end of the box to provide a darkened area. Cardboard boxes should be disposed of after each group has moved on; *do not* recycle boxes, however clean. Use of a wire mesh lid or wire front of container allows air to move through the box to aid ventilation. A small size of mesh should be used to prevent the animals becoming trapped by putting noses or limbs through the mesh. Incubators should have a small vent hole. Small drinking bowl of water should be made available at all times.

Substrate

Newspaper shredded paper at one end. Towels and vet bed blankets used with very small or very ill.

Temperature

For use with plastic crates: Animals should be given access to a 'snuggle pad' (gel filled hot water bottle, heated in microwave), heat pad or heat lamp. Heat pads can be stood on side for invalids or hypothermic individuals only (Immatures)

For cardboard boxes: box placed on a heat pad, with digital thermometer in each box.

Unweaned and small juveniles should have a regulated heat source in incubator; set temperature around 22-27^{0}C. Heat can be turned off when the hoglet reaches around 180g.

Environmental Enrichment

Shredded paper can be provided for immature hoglets of 300g + to make their own bed with. Towels and flannels can be used for unweaned and juveniles

Discrete litters should remain together. If mixing individuals/group: maximum of 4 small hoglets in each box. (Try to match up size and age at the time they arrive). Once box full – do not top up. If a hog dies leave the remaining hoglets as a group however tempting it is to add more.

Unknown hoglets can be grouped with care, and separated once they are feeding for themselves.

When to move from Indoor 1 *to* Indoor 2

When eating properly on own (fish crate - indoor pen) at around 200g.

Juveniles, when seen to be putting on weight and do not require supplementary heat.

6.3 Indoor 2 (less intensive monitoring)

Enclosure

Large pen measuring at least 120 x 120 cm x 100 cm high or a solid plastic open topped tub. 90 cm x 65 cm x 70 cm high, optional mesh lid. Single occupancy only. Siblings can be kept together or separated if problems are identified (fighting, losing weight), or when they get to release weight.

These pens can be constructed by providing hatches to several other pens each side which can be opened if necessary. The pen should contain a nesting box (or up-turned plastic cat basket). Hoglets can remain in this pen if being overwintered but see 6.5.

Water should be available at all times using a small drinking bowl especially if hogs are on a dry diet.

Juvenile hedgehogs - At this stage, the hogs need to be weighed regularly, initially daily, then after 3 days, every 3 days to ensure that they are all feeding properly. Any hogs which are not gaining weight should be separated and housed individually and moved where it can be more intensively monitored. Heat provided if necessary, worming and antibiotic cover if required.

Substrate

Concrete base with wood-shavings or newspaper and hay on floor, shredded paper as bedding within the hedgehog boxes. Note that shredded paper or wood shavings should not be used if the hog has an open wounds or limb injury; towels should be used instead.

Fig 6: Hedgehog in typical indoor 2 type accommodation.

Environmental Enrichment

Scatter the Spike's biscuits around the pen. Provide a litter tray with bark chippings or leaves and twigs where dried food (commercial hedgehog mix) and mealworms can be sprinkled to encourage foraging.

When to move from Indoor 2 *to* Outdoor (or directly to Release)

Adults - Once off the vet list the hedgehog should be moved to a larger enclosure preferably in an outside pen to acclimatise (outdoor 1) or straight to release

Juveniles - Summer - when 350 - 400 g. the hoglet can be moved to an outdoor enclosure and treated as a young adult.
Winter/Autumn - 500g - 600g

6.4 Outdoor 1

Enclosure

The large block built pen in mammal pens as described above can be constructed with access to an outdoor run. These runs have concrete block floors with holes to allow soil.

Pre- release pens (March - Nov) Once off the vet list the hedgehog should be moved to a larger enclosure preferably in an outside pen to acclimatise. The pen should have a waterproof hedgehog box with hay for nesting, (an upside down plastic cat basket can by used). Hedgehogs should be weighed every 3 days to monitor progress and released after seven days if weight is up and their target release weight is met. Ideally hedgehogs should be housed individually. More than one nesting box should also be provided. Drinking water should be available at all times

Substrate

The base of the pen should be covered with bark chippings and furnished with branches to create a more natural environment and hay for nesting.

The bark chippings should be replaces with fresh twice weekly and the concrete base should be scrubbed with a suitable disinfectant such as Trigene and/or power-washed between new hedgehogs.

Shelter

A waterproof hedgehog box with hay for nesting, (an upside down plastic cat basket can by used). Outside pens- half covered roof, with bedding placed under sheltered area. A converted seed bin can be used as a hedgehog box.

Environmental Enrichment

Use branches, logs and pipes to provide an interesting habitat with hay and straw for bedding. Scattering food, such as Spike's biscuits, mealworms, nuts, raisins encourages foraging.

Fig 7: An example of pre-release/over-wintering pens for hedgehogs.

6.5 Outdoor 2

Enclosures

Over-wintering pens: (Oct-Feb): Hedgehogs can be encouraged to hibernate by housing them in outside pens using hog boxes or converted cylindrical seed bins (60 cm high x 39 cm in diameter, with a 15cm hole cut out of lid) as places to nest. Dried food and water should be available. They can be soft released once their target hibernation weight of between 500 and 700 g is reached by relocating the box/bin in which nest is located to the release site.

Substrate

Hay and fallen leaves, generally taken from bedding previously used by animal in indoor 2 or outside pens.

When to move from Outdoor enclosures *to* Release

Spring/Summer release 400g
Autumn/Winter release 500 – 700 g. Must take place during milder spells
Good motions for at least 1 week
No coughing heard or noisy breathing.
No evidence of daytime emergence
All treatment finished

7 Diet

Every effort should be made to mimic the animal's natural food as closely as possible. If this is not possible, a semi-natural diet should be proposed. Artificial alternatives are not recommended, but should be listed for emergency use.

7.1 Food in the wild

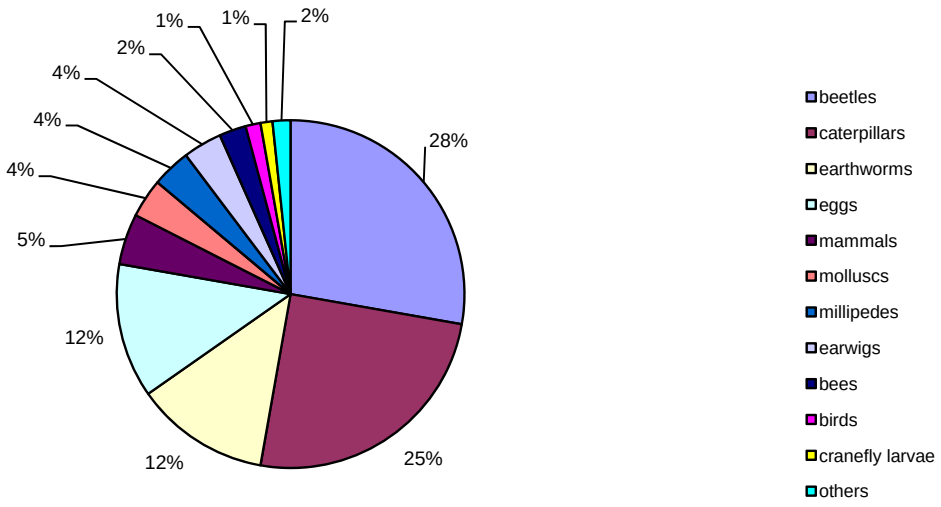


Fig 8: Hedgehog diet from Morris, 2001.

7.2 Adult captive diet

Adult Hog Food (AHF) = 1 tin cat food (not fish based)
1 tin puppy food

75g Haiths prosecto can also be added to each 80g mix or 20g Spike's hedgehog biscuits or cat biscuits.
Adult or young if not eating (a/d (Hills anorexic diet) mincemeat, 50g chicken)
Hills AD can be used for individual hogs that are not eating Baby HF or AHF, but should not be used routinely.

On arrival all hedgehogs should be provided with fresh water and a bowl of re-hydration fluids i.e. lectade. Milk should never be given. The following diets can be used depending on the casualty:
Convalescent Diet: Offering a complete liquid diet can be used for very debilitated hedgehogs, for a mouth/nose injury or after food deprivations i.e. Waltham canine convalescent diet or Hills a/d.
Short Term Maintenance Diet: As above. High protein dog or cat food i.e. Pedigree Puppy Chum fed alongside a complementary dried hedgehog food such as Spike's or Wildthings. A teaspoon of an insectivore diet i.e. prosecto can also be added to the meat if the hedgehog needs encouragement to eat or to add variety.

Pre-Release Diet: Dried cat/dog/hedgehog food i.e. Hills/Spike's* should be sprinkled in the pens to encourage foraging. Also mealworms can be fed twice weekly to add variety.

Amount Required: A daily food requirement of 60-90g wet weight (18-28g dry weight) of food per day has been calculated based on an estimated daily energy requirement of 90-140kcal per day for a hedgehog weighing 500-700g

NOTE: ingestion of food should be monitored and recorded daily, hedgehogs will over-eat and become obese in captivity. Over-feeding leads to excessive deposition of intestinal fat and may result in lameness and fatty liver disease.

* Spike's biscuits is a specialist food design to supplement hedgehog diets. Contact details are at the end of this protocol.

7.3 Adults - Frequency of feeding

For very sick and underweight individuals food should be available for 24 hours, with fresh food provided twice daily. Uneaten food should be discarded. Otherwise the normal regime would be once every evening. Remove uneaten food in the mornings. However, if the hedgehog has not eaten, leave food out but not for more than 24 hours and check on hedgehog if it still has not eaten after 1 day.

7.4 Young hedgehog captive diets

Feeds are given according to weight on admission.

Feed with liquid Esbilac and nothing else added except the following to allow the hoglet to adapt:

1st feed should be lectade
2nd feed ¼ esbilac + ¾ lectade
3rd feed ½ esbilac + ½ lectade
4th feed ¾ esbilac + ¼ lectade
Then onto full esbilac.

Figures 9 and 10: Very young hoglet being syringe fed, then being encouraged to lap.

Hoglets should be syringe fed and then when eyes open (about 2 weeks), introduce a shallow bowl of Esbilac to encourage the hoglet to lap from. Introduce solid food when teeth start to appear (about 3 weeks).

Fig 11: Young hoglet being toileted.

Hogs need to be gently toileted with warm olive oil and cotton wool after each feed. Watch for sore bottoms as they seem to get them frequently.

Stomach tube routinely. If hoglet feeds better by teat or from syringe do it that way, but mark up on feed charts so everyone knows.

Weight of hoglet	Amount of food
50 g	2-3 mls every 2-3 hours
50 – 100 g	5 feeds daily of 5ml
100 – 125 g	4 feeds daily of 10ml
125 – 150 g	3 feeds daily of 10ml as hoglet increases food intake through lapping, reduce the number of feeds.
150 – 175 g	off feeds

Table 2: Frequency of syringe feeding for hoglets

Weaning Hoglets

Hoglets under 200g	=	BHF(Baby hog food), Esbilac – in separate bowls
200g – 300g	=	BHF + AHF.
300g and over	=	AHF (Adult hog food)

Baby Hog Food (BHF) =
1 tin puppy or cat food
Bogena/prosecto (insectivorous diet)
Supplements, e.g. Pancrex, can be used.
Mealworms for fussy eaters

Adult Hog Food (AHF) =
1 tin cat food (not fish based)
1 tin puppy food
75g Haiths prosecto can also be added to each
80g mix or 20g Spike's hedgehog biscuits or cat biscuits.

Utensils: Syringe: 1ml for very small hoglets changing to 2ml, then 5ml as appropriate with an attached teat. For very small and poor feeders, hoglets can be stomach tubed. An experienced carer should only do this. Separate sterilised teats and tubes should be used for each hog.
Weight gain: Hoglets should be weighed daily in order to monitor their progress. The weight gain varies between individuals but on average the hoglet should have doubled its birth weight in the first seven days. A steady weight gain of 2-4g a day up to weaning is around the norm.
Weaning: Weaning should commence with the arrival of the first teeth (about 21 days). When first teeth start to erupt, provide Spike's biscuits scattered on floor of enclosure to encourage eating solid food. Hoglets found at three weeks should be started on weaning foods straight away. Always offer the same milk substitute as used for hand feeding to avoid stomach upsets. Offer milk substitute in a shallow dish and encourage lapping by placing the hoglet close to the milk substitute. Gradually reduce milk substitute offered. Aim to have weaned off milk substitute by the time they are 200g weight. If hoglets are reluctant to take the solid food, mix with some of the milk substitute and offer that to encourage them to eat solid food.

7.5 Young hedgehogs - frequency of feeding

Feed every 2 hours if just arrived or newborn, then every 3 hours from a few days old and settled in care and every 4 hours once eyes are open. May need to vary depending on individual hog.
Feed from 7am until 11pm, with optional one night feed for the first week with very tiny young.
If a hoglet won't feed then check that the milk substitute has not gone cold and the hoglet is warm. Try toileting it. Feed at a slow rate to avoid aspiration pneumonia, if a bubble of milk substitute should appear from the nose, stop feeding and tilt the hoglet's head down. Give the hoglet time to recover then recommence feeding. Clean excess from mouth & chin.
Quantities: Feed 25% of bodyweight in ml e.g. 1.0ml per 25g bodyweight per 24 hours, therefore for a 24g hoglet would need 6mls of milk substitute in 24 hours - e.g. 6 feeds of 1.0ml
Avoid overfeeding as this can lead to bloat. If the hoglet is gaining weight at an acceptable rate then it is getting enough milk substitute. The hoglet should be toileted after each feed, a dampened cotton bud can be used to stimulate urination/defecation. Remember variations will occur between hoglets.

7.6 Supplements

Avipro (pro-biotics) and post antibiotic treatment if problems with worms

7.7 Environmental enrichment

Scatter the Spike's biscuits so as to encourage foraging.
Adults and juveniles should be offered mealworms.

8 Preparation for release

8.1 Training the animal for survival

The hedgehog must be an appropriate weight for the age, sex and time of year and it must be able to roll up tightly and have a full coat of prickles when released. It should also be capable of normal locomotion, have sufficient fitness for sustained activity and be able to recognise, catch, manipulate, consume and digest their natural prey.

Do not release if:

- Severely disabled
- Unable to curl up properly
- Lacking a full coat of spines
- Less than 8 weeks old
- Weight is below 600g and will need to hibernate soon

8.2 When to release

Suggested weights for juvenile hedgehogs for release:

- April -Mid-summer 400g
- Sept – Nov 500 - 600g
- Dec – March 600 - 700g

Hedgehogs can be released during the winter when weather forecast is mild (5ºC+) for at least 3-4 nights. Providing animals are released in protected tubs. Hibernating hogs may be released on sites but only if in hibernation nest boxes – old seed tubs are ideal.
Summer, anytime. Long spells of drought should be avoided.
Releases should be during the evening or at dusk.

8.3 Where to release

Release adults back where found whenever possible, otherwise at a new site. Juvenile siblings may be released individually. Release in areas already populated by hedgehogs as this illustrates a suitable environment. Suburban gardens, villages and adjacent to golf courses are ideal. Be careful not use the same site too often – try to use sites every two years or greater, if possible.
When offered a potential site as a hedgehog release site it should be surveyed and the following factors considered:

1. Accessibility for hedgehog to get in/out of garden.
2. Amount of badger activity in immediate area.
3. How close to busy roads.
4. Availability of nest sites within immediate area especially if releasing here within the colder months (i.e. thick hedges, shrubs)
5. If site owner is sensible! Sometimes get people who want hedgehogs for sake of their garden and not willing to stop using slug pellets and don't particularly care about hedgehogs' welfare.
6. If hedgehogs are already present in the area - often the deciding factor.
7. Safety within the garden - uncovered drains, cattle grids, steep-sided ponds.

Do not release:
Do not release near busy roads

Do not release where there are active badger setts
In frosty or drought conditions, when the ground is very hard or when very wet as the hedgehog will have difficulty finding dry nesting materials
Do not release in gardens which are known to contain ponds without escape ladders, where slug pellets (or similar) are used or which are completely enclosed, as the hedgehog will not be able to find sufficient food.
Do not release in areas where there are no other hedgehogs because they will need to interact with other hogs.

8.4 How to release

Hard release:
Used for adult hedgehogs which have only been in captivity for a short period and which can be released back to the area in which they where found.
Release in the evening
Release via a suitable nest box or in dense vegetation with plenty of nesting material.
Alternatively, release wrapped in hay bedding and tucked into a sheltered spot on site. If in cardboard box, release boxes should be taken to the site during the day and placed in sheltered spot and opened in the evening to allow the hedgehog to leave.

Released animals may benefit from some supplementary feeding, using Spike's biscuits or similar, but care must be taken that the animals do become dependent on this food source.

Soft release:
Used for hand-reared juveniles
Provide a nest box and provide supplementary food
Release at dusk
Continue to provide food every evening for first couple of evenings.
Protect food from cats etc, an upturned plastic box with a hole big enough for a hedgehog can be used to cover the food.


Figures 11 and 12: Young hedgehogs can be released using a hibernation nest box (left) while adults can be hard released (right)

8.5 Information

Permission required from garden or land owners before release.

8.6 Tagging

Numerous studies have indicated that hand-reared hedgehogs can adapt to life back into the wild, providing correct procedures are followed e.g. adequate release weights, badger free zones etc.
Hedgehogs can be monitored post-release by the following methods:

- Radio-tracking: a transmitter is glued to the spines
- Permanent marking e.g. ear tagging
- Non-permanent marking: gluing coloured beads to the spines, marking with correction fluid or electrical wire superglued onto spines - method that we do now is very easy and clearer to see than ear tags although not as permanent.

Hedgehog Tag Details:
Size A – Hellergrip PVC Cable markers – obtained from Radio Spares (RS) (in catalogue) http://uk.rs-online.com/web/p/cable-markers/0391766/

Fig 13: This type of electrical tubing is ideal for marking individual hedgehogs, even albino ones like this!

Fig 14: Hedgehogs can also radio-tracked by fitting them with transmitters that can be detected with specialised receivers.

9 Areas for research

- *How successful are mid-winter releases?* Measuring survival to breeding season of autumn and winter admissions released during predicted hibernation periods especially if hedgehogs are relocated? Currently underway at Mallydams.
- Measuring post release survival of artificially reared unweaned juveniles by using radio tracking.
- Grouping of individual hogs
- Worming treatment
- Parasite loads on release.
- Treatment for ringworm: is humidity a factor? Problems with liver as a result of treatment?
- It has been noted that many hedgehogs coming into West Hatch from different parts of the West Country have had very few, if any, fleas.
- CCTV for group housing to determine when young hedgehogs need to be separated.
- Survival of disabled hogs in sheltered gardens and in the wild.

10 References

Bullen Kay: Hedgehog Rehabilitation Hedgehog Preservation Society

Huijser, M. 2000*. Life on the edge: hedgehog traffic victims and mitigation strategies in an anthropogenic landscape*. PhD thesis, Wageningen University, Wageningen, The Netherlands*.*

Jackson, D.B. and Green, R.E. 2000*.* The importance of the introduced hedgehog (Erinaceus europaeus) as a predator of the eggs of waders (Charadrii) on machair in South Uist, Scotland. *Biological Conservation*, **93**, 333-348

Morris, P. 2001*. Hedgehogs.* Whittet Books, Suffolk*.*

Morris. P. 1998 Hedgehog rehabilitation in perspective. *The Veterinary Record*. **143.** 633-636

Morris, P and Warwick H. 1994 A study of rehabilitated juvenile hedgehogs after release into the wild. *Animal Welfare.***3.** 163-177

Morris, PA. 1997 Released, rehabilitated hedgehogs: a follow-up study in Jersey. *Animal Welfare*. **6**: 317-327

Morris, PA, Meakin K., and Sharafi S. 1993 The behaviour and survival of rehabilitated hedgehogs (*Erinaceus europaeus*) *Animal Welfare*. **2**: 53-56

Reeve, N 1998 The survival and welfare of hedgehogs (*Erinaceus europaeus*) after release back into the wild *Animal Welfare*. **7**: 189-202

Robinson I. And Routh, A. 1999. Veterinary care of the hedgehog. *In Practice*. **21**: 128-137.

Sainsbury, AW, Cunningham, AA, Morris, PA, Kirkwood, JK, and Macgregor, SK. 1996 Health and Welfare of rehabilitated juvenile hedgehogs (*Erinaceus europaeus*) before and after release into the wild. *The Veterinary Record*. **138.** 61-65

Sykes L & Durrant J. 1995 The Natural Hedgehog Gaia Books Ltd

Leaflet: British Hedgehog Preservation Society “Know Your Hedgehog”

CD Rom: Wildlife Network Information Services “The Hedgehog”

East Winch Levamisole treatment

11 Additional information

Spike's biscuits are available from Spike's World, Moorland Way, Lincoln, LN6 7JW. 01522 688300. www.spikesite.co.uk

Fig 15: A 'wheelie' run, used at Stapeley Grange for hedgehogs