Rescuing and Treating Macropod Fence Injuries

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1. Introduction

Macropods rescued from wire fence entanglement are considered by some wildlife carers, organisations and veterinarians to not be able to be rehabilitated. When a fence injured macropod cannot immediately stand and hop away when released from a fence it is erroneously assumed to have a permanent disability and is consequently euthanased. Our experience and research over many years involving around 400 fence injured macropod rescues suggests this is an incorrect conclusion. It is also incorrect to believe that a macropod released from fence entanglement should naturally be able to hop away. Our experience is that in almost all cases a macropod released from wire fence entanglement should be brought into care no matter how mobile it might appear to be.

In an earlier paper (Austen 2008) it was demonstrated through a sample of 50 consecutive cases, that macropods rescued from wire fence entanglement can be treated, rehabilitated and released with a very high degree of success. Our ongoing monitoring of released macropods (Garlick and Austen 2010) suggests that there are no longer term problems in the wild for the rehabilitated fence injured animal. 'Kicka', now celebrating her 21st birthday and enjoying the luxury of resting on a verandah, is an example of a kangaroo entangled in a fence when quite young and successfully treated and released back to the wild (Plate 2).

The initial rescue, treatment regime, and ongoing rehabilitation program are the important elements in achieving a good outcome for the fence injured macropod. More than one-third of the more than one thousand macropods we have successfully rehabilitated and released to the wild over the past decade have resulted from wire fence entanglement.

Despite lobbying, local authorities in rural and semi-rural areas generally express little interest in regulating for known wildlife friendly fencing alternatives to replace the centuries-old multi-strand wire fencing, grotesque and completely unnecessary barbed wire fencing and clip-lock fencing, all of which are a hazard to negotiate for many forms of wildlife (Plate1).

This paper aims to assist wildlife rescuers and carers with more detailed information about the techniques to use in performing a successful macropod fence rescue, and the treatment , husbandry and rehabilitation which might be needed to help in the recovery of the fence injured macropod.

2. Why rescue and rehabilitate fence injured macropods?

Along with motor vehicle accidents, dog attacks, and irresponsible and uncaring human activity, wire fence entanglement is a common cause of the death of large numbers of macropods and other wildlife. It's a particularly horrible way to die and something that can be easily attended to by knowledgeable and committed rescuers and carers with a good degree of success. Macropods have adapted to changing climate over 16 millennia, however the loss of habitat through increasing population growth and the increasing application of neoliberal values by humans towards our wildlife, now means the macropod is

living precariously in this country. A lethal virus mutation could have catastrophic impacts on this iconic species in these difficult human engineered environmental circumstances. With the rapidly declining numbers of macropods throughout Australia (Mjadwesch 2011), any knowledge gained in the preservation of these animals can only be of benefit.

Plate 1. Typical macropod fence entanglements (note six strand barbed wire on a rural property without stock)

Plate 2. 'Kicka: Fence entanglement survivor now 21 years old

3. The Rescue

3.1 Tools

For fence entanglement rescues we ensure we have the following equipment: large wire cutters, wire separators, blanket, foam rubber mat for use as a stretcher, basic first aid kit (including sedation, pain relief, crepe bandage), Chloromide spray, and large net (Plate 3).

Plate 3: Rescue equipment

3.2 Planning the extraction method

Planning the release should be done some distance away from the entangled animal to prevent it from being further stressed. Ideally there should be two rescuers, one to contain the animal and the other to free the animal from the wire. The approach and release needs to occur quickly and purposefully to prevent the risk of hip dislocation or leg fracture. If you are on your own it is best to move quietly but quickly and cut the wire immediately (Plate 4). If the animal is large and caught by one leg this is the safest and most effective method. With two rescuers the animal can sometimes be covered with a blanket and restrained to prevent further injury to itself and then injected with sedative (diazepam) through the blanket. This can carry the risk of being kicked by the animal if it is caught by one leg and still very feisty. If you do not feel confident, do not risk injury, do not hesitate, just cut the wire and release the animal. If the entangled animal is a small joey and there is a single rescuer the joey can often be picked up and held so the danger of further injury to the joey is removed and then the leg released. Mother is often present and sometimes a protective dad. If the joey calls in fright, mother, other females and the dominant male will all try to protect it and chase you away. We have experienced this numerous times so be aware and check the vicinity for other kangaroos. Plate 5 shows a small macropod caught in a wire fence and brought into care and named Tiger, with his mother standing guard nearby during the rescue.

Plate 4: Fence rescue of a severely compromised macropod

It is unusual to be able to immediately release back to the wild a fence injured animal. This is because of the type of injuries they sustain and is an important judgement call. We have immediately released only four of the hundreds of fence entangled macropods we have rescued. One small joey we were sure was only in a fence for less than 15 minutes – it raced straight off after its mother and got back into her pouch. Two were very small in pouch joeys which I examined, checked for hip dislocation and leg fracture, cleaned their wounds, gave a long acting amoxycillin injection and waited nearby until they were safely back in mum's pouch .Both had knuckling. One lived with her wild but friendly mother- called just 'Mum' - near our house. Her joey Baby was perfect when she finally emerged from the pouch. The other was a 70 kg male entangled in seven strands of wire. We sprayed his minor wire cuts with Chloromide spray, cut the wires and he immediately got up and hopped a short distance away, stood for a short while watching us and then hopped into the bush without apparent major injury. It took us several hours to repair the fence.

Our experience is that fence entangled animals should come into care. Coming into care does not cause myopathy. Leaving them vulnerable in their natural environment is likely to result in death (Plate 6). Removing them into an unfamiliar environment such as a room in the house or a shed reduces their anxiety especially if there are other calm in-care animals for them to observe. If advising a member of the public about a fence entangled macropod always stress the importance of cutting the wire off the limb. We have rescued several unfortunate macropods which have suffered from a long period with wire cutting into their limb. If the rescuer approaches the animal from the opposite side of the fence to the trapped animal they can cut it free without risk of injury.

Plate 5: Tiger and protective mother

4. Treatment

The fence injured macropod will usually have a number of problems that will need attention.

4.1 Sedation

We use diazepam 0.5 mg per kg SCI or IM. Diazepam is a very good and usually safe medication. This is equivalent to 0.1 ml per kg of the standard 5mg per ml diazepam solution for injection. At low dose the animal benefits from its anxiolytic and muscle relaxant effects. A higher dose is used for sedation. You should get good sedation effect with 0.5 mg per kg. We often inject through the blanket covering the macropod to avoid disturbing the frightened animal. Always approach a macropod from the back to reduce the risk of being kicked. We inject high on the thigh into the large quadriceps (anterior thigh muscle) muscle to prevent injury to the sciatic nerve. If the animal is quiet suggesting that it is compromised the diazepam dose is reduced to 0.125 or 0 .25 mg per kg and on occasion not given at all. A quiet animal suggests imminent death, hypothermia or severe dehydration and exhaustion.

4.2 Temperature

If possible check the animal's temperature. A tympanic (ear) thermometer is quick and non-invasive. Feeling the inside of the animals mouth can be misleading eg if the animal is breathing rapidly because of metabolic acidosis (discussed later) the mouth can feel much colder than the animal's core body temperature. The temperature should be 35 to 36 degrees. A hypothermic animal can be unresponsive. They should be warmed slowly using an external heat source (eg an electric blanket protected from urine and on low to medium setting, never on a high setting). Warm water or rehydration solution (eg Lectade or

Vytrate are helpful . IV fluids (veterinary treatment) are most effective. We also use warm subcutaneous fluids although the absorption is slowed in a hypothermic animal.

If the animal has hyperthermia (temp over 37.5 degrees) as can occur in summer it will also usually be dehydrated .It will have a rapid respiratory rate and will be salivating and licking its forelegs. We offer them cool water to drink, SC fluids, cover them with a wet towel and lay them if front of a fan. This is usually very effective in cooling them and making them more comfortable.

4.3 Fluids

Fence entangled animals will often be dehydrated. If the animal will drink water it is usually a good prognostic sign. Small joeys will often take a bottle of warm formula once feeling safe and relaxed in a bag. However, ensure that the joey is normothermic and well hydrated before feeding. If necessary, normalise temperature and offer rehydration solution. Because of the high risk of renal damage due to myoglobin (a muscle protein) caused by stress myopathy or the muscle trauma caused by the fence entanglement we always give the macropod SC fluids. At minimum 5-10 percent of body weight over 24 hours in 1-4 volumes is given depending on the size of the animal. For a 20 kg animal, for example, we would give 500 ml of fluid SC quite quickly using a giving set and an eighteen gauge needle . The animals do not appear to be much discomforted by this and will often just keep eating .Fluids are given for at least 2 days ensuring that the animal has a good urine output. If the animal is not drinking well continue SC fluids for another 2-3 days. We use Normal Saline (NS) or 4% Glucose 0.18 % NS not Hartmann's solution (contains potassium). Ensure the animal always has access to as much water as it wants. With IV fluids there is the risk of fluid overload, heart failure and death so it is not recommended unless under veterinary supervision.

4.4 Myopathy

Fence entangled animals are severely stressed and will have myopathy. A dose of vitamin E/Selenium (1mg Selenium and 50mg Vitamin E per one ml) is always given for 3 days at 0.05ml per kg. In severe cases the treatment is extended to 5-7 days at 0.025 ml per kg. Small joeys are given the initial dose and often then given Vitamin E (1 drop from a 500 IU capsule) subsequently in their formula.

The lactic acid which is produced in myopathy and extreme exertion causes a metabolic acidosis .This results in the animal breathing more and more rapidly to breathe off carbon dioxide. Metabolic acidosis can if not corrected cause respiratory failure and death. It is important to recognise this problem. If the animal has had diazepam to reduce its anxiety and is not hyperthermic but its respiratory rate is elevated it is likely that it has a metabolic acidosis. We now give all macropods which have been caught in a fence a dose of sterile sodium bicarbonate IV infusion (8.4grms per 100ml) at a dose rate of 1ml per kg and diluted in normal saline SC at rescue. If the respiratory rate continues to rise and the animal is becoming distressed veterinary advice is sought. A dose of sodium bicarbonate IV infusion at a dose rate of 1ml per kg can be given IV and might need to be repeated . IV fluids are also given at this time.

To reduce stress while in care, macropods more than 10 kg are given a dose of Modecate (Fluphenazine Decanoate, 1 mg per kg IM).This is not essential if not available but it is useful to reduce the stress of being in care especially for the larger animals. It is particularly helpful when the animals are starting to want to stand. They will recover mobility more quickly if they are prepared to just stand and strengthen their muscles without trying to hop which initially will result in them falling over. Modecate helps to keep the animals calm in this frustrating recovery phase.

Housing is an important factor in reducing stress. Macropods are less stressed being inside than out in their natural environment. They are hyper vigilant when housed outside and always become agitated when approached. When housed inside they are exposed to a whole new set of stimuli which they do not interpret as indicating a threat , are much more relaxed and very quickly become accustomed to being approached .A telephone ring inside causes no reaction but a bird screech outside immediately causes panic. If always offered food or water or an outstretched hand to sniff along with reassuring talk a trusting relationship is very quickly established and they will quite happily let you sit beside them and scratch their ears but protest when another kangaroo comes near them.

4.5 Analgesia

Fence entangled macropods will be in pain .Myopathy, muscle trauma, lacerations fractures, hip dislocations, ischaemic injury are all very painful. We do not use Metacam (Meloxicam) because of the possible renal damage caused by myoglobin. Painstop (paracetamol and codeine, 1 ml per 2.5 kg –equivalent to approximately 10 mg paracetamol per kg) or Tramal (Tramadol, 1mg per kg IM, with veterinary advice) are effective. Although in pain you can be sure that they feel substantially better since the second the wire was cut! We will never forget the relief on a small hypothermic and exhausted joey's face when we picked her up and took the strain off her leg and cut the wire which had been torturing her.

4.6 Hip dislocation

There is the risk with fence entangled animals that they will have dislocated their hip. This is because when hanging in the fence the hip joint is put in traction. The hip is a ball and socket joint and the traction pulls the head of the femur (the ball) out of the acetabulum (the socket). The animal then twists and puts the hip in external rotation which results in an anterior dislocation. This has a poor prognosis and can be difficult to diagnose. The easiest method to diagnose a dislocated hip is using three bony prominences in the hip and pelvis (Plate7).The prominences should form a V shape. If the V points towards the abdomen the hip joint is in normal position. If the V points towards the back of the animal then the hip is likely to be dislocated. If the alignment appears abnormal but not as pronounced as forming a V shape it is possible that the hip is not dislocated but subluxed. The prognosis is better if the animal is small and happy to stay in a pouch for several weeks after reduction of the dislocation. We have had a large female (Bluebell) who required considerable traction under anaesthetic to reduce her subluxed hip. She was compliant with non-weight bearing for several weeks and is now doing very well and has adopted 4 other orphans in the enclosure and feeds them as well as her own at heel joey that came into care with her (Plate 8).

Plate 7. Normal Hip Position

Plate 8. Bluebell and the milk bar queue

If there is concern that the hip is dislocated because of the abnormal alignment of the bony prominences the macropod should be assessed by a veterinarian. Do not assume that because an animal cannot stand or because its leg is splayed out to the side (ie is abducted and cannot be adducted) that it has a dislocated hip .This can be due to neurological and soft tissue injury. Can you imagine how you would walk if you had been hanging upside down suspended by 1 leg for 24 hours at -4 degrees.

4.7 Ischaemic Injury

Macropods are usually caught very tightly by the wire. This interrupts blood flow to the local and distal tissue and causes ischaemic damage .The severity of the ischaemia is not immediately obvious. If the skin distal to the wound feels very cold to touch compared

with the other leg it is possible that necrosis will be severe. After several days the extent of the ischaemic injury will become more obvious. Fence entanglement wounds should never be sutured .Although the wound can appear initially to be a simple laceration which can easily be sutured there will always be some necrosis of local tissue and worsening of the wound. Even if there is no laceration but just wire marks on the skin you will find that about a 1- 2 cm band of skin will become necrotic and peel away over a few weeks leaving a large wound. A number of weeks can be required for debriding of necrotic tissue and redressing before healing can occur and lost tissue is replaced. Severe ischaemic injury is the major cause of death (euthanasia) second to myopathy in fence entangled animals. It is very distressing because the animals are well otherwise and have often survived the horror of the fence entanglement and myopathy but have a 'dead foot' .

4.8 Wounds

Most fence entanglement wounds are severe and should not be sutured. Barbed wire causes extensive tissue damage. The wounds are often dirty. The best outcome is achieved if they are cleaned and debrided under anaesthetic. If this is not an option they can be cleaned when the macropod has had diazepam and analgesia. It is important to flush the wounds very well with large volumes of sterile NS or if this is not possible with warm boiled water (or boiled NS- 0.9 g salt per 100 ml water and boil). Any debris is removed with sterile forceps. Use rubber gloves for cleaning wounds if possible.

Once the wound is cleaned, we apply Betadine ointment and / or Manuka honey, a non-stick dressing, Soffban (synthetic or natural) for padding, crepe bandage and a latex cohesive dressing such as Vetwrap. Care is taken never to make the dressing too tight. This is the reason we use soffban padding to reduce the possibility of a dressing interfering with blood flow to already compromised tissue. Care is especially required when using latex wrap such as Vetwrap. Always bandage the whole foot to the toe nail otherwise oedema distal to the dressing can occur.

When there is knuckling (discussed in the next section), toe or foot fractures or tendon injury can be present. We usually reinforce the toe (metatarsophalangeal joint) and/or foot with a light splint in a slightly dorsiflexed position. Antibiotics are always started on the day of rescue – Betamox (Amoxycillin 150mg per ml), 15-45mg per kg second daily and Baytril (Enrofloxacin 50mg per ml), 5 - 10mg per kg once daily for 2 weeks and then changed to Oxytet-200 L.A. (Oxytetracycline 200mg per ml), 200mg per 10kgevery 3-5 days if ongoing antibiotics are required.If anaerobic infection is suspected Metronidazole is given SC 20mg per kg once daily.

4.9 Neurological injury

Hanging in a fence causes stretching of the nerves in the leg. It is common for fence entangled animals (especially if caught by one rather than two legs) to have knuckling (unable to dorsiflex toe) or foot drop (unable to dorsiflex foot) caused by injury to the sciatic nerve. The splaying of the leg out to the side is due to inability to adduct the leg due to injury to the obturator nerve (Plate 9).

Plate 9: Neurological injury

These injuries can take several months to heal and splinting is required to prevent damage to the joint (Plate 10).

10: Splinting to prevent knuckling and foot rop

4.10 Fractures

Fractures can occur in fence entangled macropods. Most common are toe (phalangeal) and foot (metatarsal) fractures and these heal well if they are splinted. Ensure adequate calcium and vitamin D to encourage strong, healthy bones. Fractures of the long bones of the hind leg are uncommon.

4.11 Tendon injuries

In many fence injured animals there will be tendon injury of variable severity. Suturing lacerated tendons is often not successful because ischaemic injury can cause necrosis of tissue at the suture site. As mentioned previously ischaemic injury is difficult to predict and depends on tightness of the wire and duration of entrapment. Laceration of the tendons involved in dorsiflexion of the toe also contributes to knuckling. Persistent difficulty with toe dorsiflexion interferes with punting not with hopping and these animals cope very well.

5. Husbandry

As mentioned previously macropods are less stressed if removed from their natural environment and not exposed to stimuli which they recognise as indicating a threat and therefore cause panic. As most fence entangled animals are unable to get up for lengthy periods after rescue we house them on gym mats covered in straw. This reduces the risk of pressure sores and they appear to find it very comfortable (plus the added advantage of being able to nibble on their bed) (Plate 11).

Plate 11. Mat and straw bedding for the recovering fence injured macropod

The animals always need access to plenty of water. Some animals including very large macropods enjoy formula in a bottle or dish and this aids their nutrition. VAM, a vitamin and mineral solution for injection, and Nutrigel, an oral vitamin and carbohydrate supplement are also used for some animals especially if nutritionally compromised like those which have been released from a fence and left to fend for themselves without assistance with their injuries (Plate 12).

Plate 12: Ruby

A trusting relationship needs to be developed with these animals for them to thrive. One of the factors which makes fence injured macropods easy to care for and also do very well is the fact that they usually cannot get up and flee when you approach. Because of this they learn to trust the carer very quickly. For example the fence injured animal shown in Plate 13 (Sharkie) had been in care for less than a week.

Plate 13: Sharkie

6. Rehabilitation

Myopathy and muscle trauma cause muscle stiffness which can be helped by gentle exercises such as flexing and extending the hind limb joints (slowly bending and straightening the leg). Repeat movements 20 times several times per day. This will help reduce flexion contractures developing while the animal is not able to stand. The recovery usually occurs in several stages. The first is helping the animal to a standing position and supporting it until it regains strength and is able to stand on its own. Often straw bales are useful for them to lean on and support themselves. The straw bed also provides a soft landing when they fall over. In summer we often place the animals out on the grass and stand them up every time we walk by. They will stand for as long as they can and usually topple over if they attempt to hop. This is the stage at which Modecate is very useful because the animals recover more quickly if they are relaxed and prepared to just stand for

an extended period gradually increasing the strength and flexibility of their muscles. If they have flexion contractures in their hamstring muscles, in particular, we stand them up and gently place downward pressure on their thighs slowly stretching tight muscles and tendons to achieve feet placed flat on the ground. This can also be helped by placing food and water bowls in front of them and they slowly achieve enough flexibility and strength to lean forward and reach their bowls.

The next stage after regaining the ability to stand is to hop. Macropods are very determined and courageous patients and would be a joy for any physiotherapist to treat. They are never discouraged by falls and will keep trying until that magic day when they manage to take a few hops and retain their balance. Once this is achieved improvement is often very rapid. The next stage is to regain the ability to get to the standing position without help. This is always more difficult for those animals which have been caught by both legs. If knuckling has been a problem the splints which support the toe (metatarsophalangeal joint) will often need to be used for an extended period until there has been complete neurological recovery. Punting, the last stage of recovery, is the most difficult movement to be regained. Some of the animals learn to move both hind legs alternately so it is more like a walking action until punting can be accomplished.

7. Conclusion

This paper has shown that fence entangled macropods can be successfully treated, rehabilitated and released. It should not be assumed that because an animal cannot stand and hop away after release from a fence that it needs to be euthanased. Conversely, fence injured macropods in most instances should come into care for treatment and rehabilitation. It is erroneous to conclude that the animal will do better in the wild without assistance.

References

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